

## PERSONAL PROBLEMS OF MANAGEMENT.

*Paper presented to the Institution, Glasgow,  
Leicester, London, and Southern Sections,  
by W. Puckey, M.I.P.E.*

### Introduction.

I WISH to make quite clear that I speak, not from many years of management responsibility, but as one young enough in management to be grateful for any criticisms, I hope constructive, many of you here will no doubt shower upon me later, but old enough in management to realise the many problems and pitfalls besetting my path. The subject is very wide, and therein lies the difficulty that in dealing with its many aspects I shall not do it full justice.

First of all there were two questions that puzzled me in planning this lecture : (a) What sort and size of factory should I deal with ? (b) In what manner shall I approach the subject ? Well, in view of the fact that I consider engineering to be the basis of nearly all manufacturing, and has brought me most of my experience, I shall deal in general with an engineering factory, but it is important to remember that many of the functions of management are independent of product. Again, as according to the latest returns available, the greatest percentage of workers are employed in factories of between 100 to 250 employees, I should deal with such a factory. As, however, the next highest percentage of workers is in factories employing 250 to 500, I will deal more specifically with the latter, as management problems tend, I think, to become intensified with the larger organisations. Here again, many management functions are independent of factory size. It is interesting, by the way, to note that both the number of factories and also the number of employees in factories employing 1000 or more shows a decrease of over 20% in three years, which might infer that the larger unit is being recognised as a less efficient one.

Regarding question (b) I felt that the best way to approach the subject would be to imagine myself as a works manager who has just been appointed to a new post and to discuss in some sort of logical sequence, the various problems confronting me.

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### Personal Responsibilities.

Why am I required ? If the previous man has been fired I should endeavour to use his weaknesses and troubles as stepping stones to my own success. I may realise that in the glow of obtaining my managerial post I omitted to ascertain my exact responsibilities in the organisation. If so, I will probably find that wherever I turn I shall find somebody's toes waiting to be trodden on and often, sad to relate, anxious to be. I may also find myself responsible to several individuals, each carrying equal responsibility, equal capacity for interference, and divergent opinion. *Moral* : For your peace of mind, ascertain your exact position before accepting the job.

### Atmosphere of Factory.

I do not refer to the reactions of the nose but to that intangible present relationship of everybody to everybody which is the result of past tangible relationships or lack of them. Every factory has its own atmosphere, some as the rose, some as the sewer, and the category in which it is placed is, I believe, of some importance and would repay a little national and local investigation. What am I going to do when I place it ? If the firm has been established some time, little can be done in the course of a year or so if the reputation is bad. If a new firm, what you can do with it depends to a great extent on what I am going to discuss shortly.

It does, however, help in most cases to analyse your investigations with a view to the elimination of the bad impressions. You may find that a reputation for bad service has been established. An unenviable reputation may have been built up through a bad patch of labour trouble. You have to remember that one's good points are usually taken for granted, whereas faults are definitely not. Fig. 1 details some of the impressions you may find expressed when you investigate the atmosphere.

FIG. 1.

### Factors adversely affecting external goodwill.

<i>Untidy and dirty Factory.</i>	<i>Non-Union labour.</i>
<i>Poor reception of visitors.</i>	<i>Poor work.</i>
<i>Unsatisfactory working conditions.</i>	<i>Bad deliveries.</i>
<i>Unsatisfactory payment to workers.</i>	<i>Poor service.</i>
<i>Bad rate fixing.</i>	<i>Unfair prices and practices.</i>
<i>Poor supervision.</i>	<i>Bad payer.</i>

The grade of work performed by the firm is another aspect of the problem. "Rolls Royce" quality is an example. It is important to bear in mind, however, that such a standard as that just implied is not always necessary. Some factories produce one grade of work, some another, their only common ground being their ability to do

their respective jobs in the most efficient manner. The man in the instrument factory who looks down on the agricultural machine producer is an unintelligent snob.

While on the subject of impressions, do carefully note and record the impression the external and internal appearance of the factory made on you, while the impressions are fresh. It is surprising how many firms ignore this matter, not realising that every caller, whether buyer or seller, can spread good or bad impressions, particularly the latter, in a very effective manner.

FIG. 2.

**Future policy of Company might be along the following lines :**

*Expansion or curtailment of existing lines and/or production.*

*Is quality standard to be altered ?*

*Is Company planning new lines ?*

*Does Company wish concentrated effort on points shown in Fig. 1 ?*

### **Future Policy of Company.**

It is important to ascertain the future policy of the company. A clear statement on this matter will be a valuable guide as an indication of the course to steer by. Fig. 2 brings out some aspects of this question and is almost self-explanatory. I might state, however, that future *sales* policy is often divorced from actual results, and knowledge gained here might be tempered by the coolness of past experience.

Going into management reminds one of a high dive. One minute you are outside, the next you are completely in it. Carrying the analogy still further you are invariably upside down when you get into it.

One of the first things I should do would be to call for a list of all outstanding orders and dates, and make myself thoroughly acquainted with them, particularly overdue ones. Customers will not as a rule extend much sympathy regarding their overdue order when told that a new manager is looking into things. Acquaintance with the exact position will enable one at least to give a plausible excuse and definite promise. Don't, if the volume of work in hand is considerable, tackle all the jobs at once, but concentrate on them to a strict priority list compiled by sales.

I will, I hope, find that the chief inspector is not responsible to me. He should, in my opinion, report to the managing director. Here is a man with whom I should have a complete understanding. One important point arising here is the fairly common one of departmental heads stating, when quality questions arise, that *they* are beyond reproach because the part has been passed by inspection. I feel most strongly on this point, and would say that if every superintendent set out to produce parts only just able to pass the standard set by inspection, they and I would not get on well together.

One problem here is that these standards are, in many cases, arbitrary ; in fact, I have heard it expressed that the only thing not standard about the standard is the standard, and as I see it, one of the most important jobs we have to tackle is the constant elimination of such arbitrary standards by suitable equipment. Measurement of noise and surface finish standards come to mind as suitable examples.

### **Relations with Higher Management.**

I define higher management as the managing director or general manager. These gentlemen have the habit of asking awkward questions and it behoves one to carefully consider their angle so that these questions may be answered as quickly and accurately as possible. Many are the opportunities for mind reading that will be presented to you, and although you may be able to present broad outline at a moment's notice, detailed knowledge may be beyond you unless you see the way the wind is blowing and prepare accordingly.

I shall often be called upon to prepare reports, and it is important for me to remember that I may not be dealing with a skilled technical man. I must therefore word my report to suit the knowledge of the persons receiving it. Some of you might say that you could not get your standards so low, but I should here like to warn you that in managing directors, ignorance is often assumed. There is an art in writing a good report. Facts must be presented in their true order and the deductions must be based on fairly concrete evidence ; there is little so embarrassing as getting tied up by the managing director over one of your statements because of lack of correct presentation.

I shall endeavour to fix a definite appointment with him daily or other suitable interval, and shall then prepare a summary of all points to be taken up, in priority of importance. The latter is rather necessary, as one doesn't always get through the list. This arrangement is much more satisfactory to both parties than the haphazard method of discussion of individual points as they arise. Fig. 3 details some of the aspects of this section of my talk.

FIG. 3.

### **Points to consider in preparing a report.**

- (1) *Give a clear heading to Report.*
- (2) *Ask secretary to type double-space with ample margin space for notes by recipient.*
- (3) *Give sub-headings to each section.*
- (4) *If report is a periodical one, always keep sub-sections in same relative order.*
- (5) *If figures from other sources are quoted, give authority.*



- (6) *Number each section and refer to sections by number.*
- (7) *If reference is made to another section, arrange as far as possible that that reference has already been read by the person to whom the report is sent.*

The degree of personal decision allowed depends entirely on the character of both managing director and manager. Many managing directors wish to know every detail of their business, while others are satisfied with broad outlines. Many managers will not make decisions without consulting their chief, while others would resent, perhaps in silence, any attempt on the part of the managing director to take responsibility from him (the works manager). The question of staff salary increases is an example. I have a happy personal experience where the managing director, after appointing me works manager, kept out of my way for over a month. I found out afterwards, though, that he was aware of every action on my part. He certainly gave me every chance of finding my level.

Disagree with your managing director if you think the occasion warrants it. In general, most chiefs regard "yes-men" with a certain amount of contempt. Avoid, however, the temptation to rub it in when you prove him wrong, as we all experience a slight feeling of resentment towards the person who corrects us, and there is nothing gained in generating that resentment, especially when he's your boss. Many managing directors have a habit of asking what appear to be mad questions. Well, some may be born of ignorance, but in all cases beware of a hidden purpose and think carefully before answering. I well remember an apprentice, who writing notes on a lecture I gave in the works on "Organisation," stated that the managing director should not have technical knowledge, as he would interfere with the work of the technical departments. The managing director's secretary saw this and pointed it out to him, with the result that I received a note asking me to award the boy full marks!

### **Organisation Layout.**

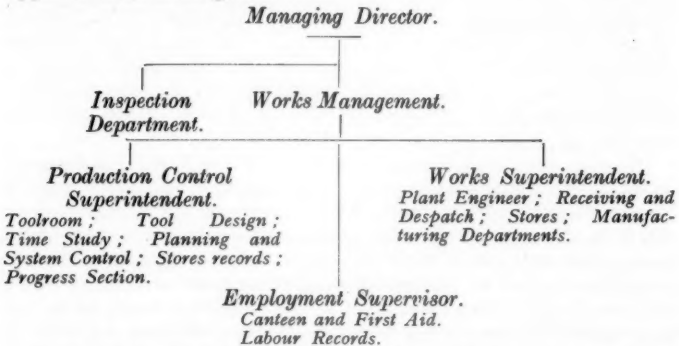
I may or may not find an organisation chart in existence. If not, I shall make it my business immediately to produce one, and have a talk with each senior staff official to make sure that each thoroughly understands his boundaries. Boundary problems are as touchy in the factory as in the national sense.

There are numerous forms of organisation and each factory varies in the officials responsible to the works manager. Taking an average case, the chart shown in Fig. 4, is typical and embodies those details I consider best. Briefly, the works manager has three key individuals responsible to him, these being: (a) Production control superintendent, controlling the technical office staff or the

"planning" side; (b) works control superintendent, controlling works staff or the "doing" sides; and, perhaps, (c) labour supervisor, supervising labour records, welfare, and, probably, first aid. The control of these three strings should enable one to ascertain any production problem in a very direct manner, and an independent report from (a) and (b) on the same subject will sometimes make interesting reading.

FIG. 4A.

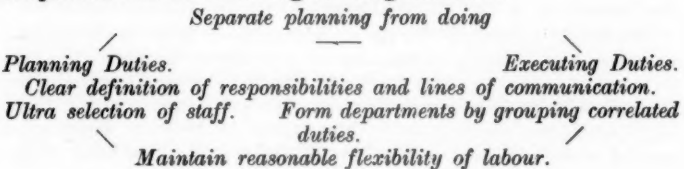
**Typical form of Organisation.**



You have heard the arguments put forward for and against the various forms of organisation but the above appears to be the best for general purposes. I have shown in Fig. 4b, some of the requirements in planning an organisation as I see them and I should particularly like to draw your attention to the fact that the transmission of orders and reports should receive equal attention to the transmission of material, in the sense that the distance transmitted should be as short and direct as possible. Don't, however, interpret this as meaning that when you, as works manager, want to know something, you ask the workman direct; a departmental head should never be short-circuited.

FIG. 4B.

**Requirements in Planning an Organisation.**



### Departmental Heads.

I come now to a very important part of my initiation, that of getting known to and knowing my departmental heads. They are the men I must rely upon almost wholly until I get around the job, and substantially at all times. How shall I get to know them? Well, I think the best way would be to see each one individually, and in his own shop. Watch him dealing with routine. I should inform each one previously that I would like a talk with him and I would get him to air his views on a diversity of subjects from politics to progress, on his past, present, and his ideas of the future, and I should make brief notes of my impressions of him. Equally important, I would ask him to let me have brief notes of his own on the outstanding difficulties of his department. I would then be able to compare these individual notes and see if I could segregate any problems which appeared common to all departments. This would give me a useful line on which to work.

While on the subject, I would also have a talk with each about his chief assistant. He may wonder whether you have in mind firing him and installing the assistant, but this depends on his conscience. I should also like to have a talk with the assistant, with his superintendent present, and if any superintendent *had* no assistant, I should certainly like to know the reason why. Many departmental heads are averse to letting any other person in the department have any information on how to run it, a state of affairs often proving very awkward to the company.

FIG. 5A.

### Advantage of conferences.

- (1) Keeps all departmental heads in touch with management.
- (2) Keeps management in touch with departmental heads.
- (3) Gives management a line on relative abilities of departmental heads by :—
  - (a) Punctuality.
  - (b) Debating powers.
  - (c) Preparation of minutes.
  - (d) Treatment of items allocated to each.
- (4) Enables policy to be collectively explained.
- (5) Enables interdepartmental "grouses" to be aired in presence of other departments.
- (6) Enables ideas to be pooled and improved.
- (7) Enables constant follow-up of all items to be made.

Many hard words have been said about departmental conferences and many have been deserved. They have, in reason, however, a very definite value even if the participants are seen half an hour before the conference dashing around with the agenda and a worried

look, finding out information. I am very definitely opposed to management by conference (there can, in general, be only one boss), but where there is business to be settled with a number of heads, the conference is of great value, as it invariably stimulates each individual to action by a given time. I believe that there should be a regular conference (in my own company it is fortnightly) in which the heads of all departments, production, purchasing, designs, sales, etc., bring forward any difficulties affecting relationships outside their department. If the chairman could be a director, decisions could be made and policy framed on the spot in many cases. It does link up all parties in the most satisfactory manner, and avoids that isolation of the office side of the business that is so much in evidence.

FIG. 5B.

#### How to handle a conference.

- (1) Select a sub-committee of most interested persons to plan first meeting and appoint a secretary.
- (2) Decide with sub-committee suitable date, time, place and agenda.
- (3) Circulate agenda as much in advance as possible.
- (4) Begin promptly. A system of fines might be considered for late comers.
- (5) Have minutes recorded. (? Is it an advantage to let each member in turn prepare minutes).
- (6) Outline purpose of meeting.
- (7) Lay down rules if no precedent can be followed.
- (8) Confine discussion to one item at a time.
- (9) Get each man's opinion.
- (10) Keep procedure informal; let others have their say before voicing your own opinions, and talk with other members, not at them.
- (11) Decide questions by general agreement wherever possible.
- (12) If opinion is divided, put question to a vote (open except in cases of extreme personal delicacy) and require a two-thirds majority to pass, or where opinion is equally divided, investigate objections personally and defer decision to next meeting.
- (13) Record every decision with summary of points leading up to it, and record name of persons to whom action is allocated.
- (14) Bring forward each incompleting item to discuss at next meeting unless agreed to defer further discussions until later date, in which case a note of item should still be carried forward, with next discussion date, and last date discussion was recorded in minutes.
- (15) Occasionally check up with members before next meeting to ascertain if any action has been taken.

(16) Decide agenda for next meeting and get added to minutes for circulation.

(17) Adjourn to schedule if time limit set.

(18) Have minutes typed, signed by chairman and circulated to members as quickly as possible.

The problem of how many work people a departmental head is expected to control is a debatable one, depending as it does on a number of factors. I am, however, inclined to the view that the number should be less rather than more. I have heard a well-known member of this Institution state that in his factory a foreman controls about 200 men. Personally, if a foreman, without a full time assistant, controlled more than 60 men in the average engineering factory, I should consider that some adjustment should be made. It would, however, be helpful to hear views on this point.

Many managing directors have been unjustly blamed by foremen and other staff because of their apparent indifference to salary increase applications. The truth is, of course, that in many cases managers, on being approached, haven't the moral courage to refuse. They fall back on the old plea that the managing director's sanction must be obtained, having at the same time no intention of asking the latter.

Few works managers have, however, the authority to put through staff rises without authority, but all should have the moral courage to settle the application promptly. The above is rather interesting as most works managers can engage without question a toolmaker at £3 10s. per week but can't put through a 5s. rise to a staff member without authority.

### System Control.

Each factory has its constants and these should be reduced to pure routine, in other words all factories should work to a system, be it simple or elaborate. There is no time-saver so prolific to the manager and staff as a systematic manner of working. Make certain, however, that you get the system on record, with a copy available to each departmental head so that no excuse on the score of ignorance can be made. To some people a form is nothing more than a slip of paper, to others a piece of red tape.

It is not realised as fully as it might be that bad system is often the cause of bad relationship between departments. Departmental heads are changed, personalities are blamed, not methods. When you get such a state of affairs, first of all examine the internal set up and you might discover the cause of the friction. Standard practice may be improved, elaborated or simplified, and there should be someone appointed who is responsible for carrying through such changes and linking together all departments. Appoint him, even if it is only a small part-time job, but don't give the job to an

office trained man, pure and simple. He is apt to imagine that the factory exists to maintain the system. Fig. 6 details aspects of this problem.

FIG. 6.

### Considerations Governing Standard Practice.

<i>Aim—</i>	To define duties and responsibilities.
	Eliminate uncertainty.
	Co-ordinate departments and regularise routine.
	Avoid verbal instructions on routine procedure.
<i>Policy—</i>	Prevent hasty judgment.
	Standard procedure must not be arbitrary.
	Make instructions simple but positive.
	Avoid personal references; use departmental names and numbers.
<i>Preparation of instructions—</i>	Make as few instructions as possible.
	Review periodically and systematically.
	Issue written standards to all concerned.
	Appoint suitable person to co-ordinate and prepare.
	Discuss each subject thoroughly with departments interested.
	Ascertain if problem to be standardised cuts across any existing standard.
	Ascertain, if new form is required, whether an existing form can be modified, or amplified to avoid a new form.

### Factory Conditions.

I will run briefly through the various factory conditions and services on which I shall acquaint myself at the earliest opportunity. I place this fairly early among my activities because they do, I think, influence production to a certain degree and should be set on a satisfactory basis before attempting to tackle more direct production problems. Incidentally, it is surprising how few works managers bother much about such services.

The need for fire fighting facilities is obvious. The upkeep is, however, often forgotten and a properly organised scheme should be instituted to test all facilities. The growing use of low flash point paints for example, has brought forward many problems in relation to fire. Fig. 7 may be of value in throwing up some of the things to watch.

FIG. 7.

### Organising Against Fire.

<i>Personnel—</i>	Appoint small committee to purchase equipment and decide procedure, etc. See that each is on the telephone.
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## PERSONAL PROBLEMS OF MANAGEMENT

Hand to each newcomer diagram of factory, and instructions what to do in case of fire.

Have him in Employment Office one week after starting, and ascertain if he thoroughly understands instructions.

Constant supervision of those employed in work tending to produce fire.

Distribute emergency fire brigade members around factory, paying particular attention to more dangerous positions. Such men should live locally.

Have fire practice among brigade members and regular inspection by qualified fire fighters.

Call occasional general alarm.

Arrange for tour of factory during lunch and immediately after closing time.

### *Appliances—*

Have ample supply of appliances available in all parts of factory and offices. Extinguishers, hoses, sand, etc.

Have periodic inspection made of such appliances. Have floor cleaners keep appliances clean.

See that no trucks, material, etc. can be parked so as to interfere with emergency rush to appliances.

Test fire mains and hose frequently.

Have distinctive fire alarm signal.

Keep gangways and exits clear.

Lighting is not often very scientific in its application. The instruments now available to check the intensity of light at any working place will often show bad conditions and in my own experience, the reaction of workers whether in factory or office to well lit surroundings is sufficient proof of its value. Incidentally, as natural light is best, the growth of factories with large areas of window space is, in my opinion, a step in the right direction provided heating arrangements keep pace. See Fig. 8 for details.

FIG. 8.

### **How to Ensure Correct Lighting.**

Design factory to take full advantage of natural light.

Have lighting scheme designed by specialist.

Issue strict instructions that no unauthorised person moves position of pendants.

Have locking rings placed on bulbs so that only authorised persons can change.

Establish light values of different sections and jobs in factory and offices and check occasionally.



Have surrounding walls, ceilings, in high reflective colour.

Have frequent organised cleaning of reflectors, bulbs and other fittings.

Design switches arrangements so that logical sections are controlled from same switch. It is false economy to control too large an area with one switch.

See that windows and roof-lights are regularly cleaned.

Avoid direct sunlight shining on workers.

Impress on all persons importance of switching off during breaks and after closing time.

Appoint someone from each department each day to check switching on and off of lights.

Have suitable pilot light systems for watchmen and emergencies.

Have exits and corridors reasonably lit.

A study of the accident reports in the factory over the last year may prove enlightening. Although one does not usually ask such people to come along, a notification to the local factory inspector that you are now in charge and would like an opportunity to have a chat is often a way of convincing that person you are out to do your best. Some people advocate an individual, or special department responsible for machine guards and similar appliances, but I feel that each departmental superintendent should be made responsible for the safety of his own department. In general it can be stated that the safeguard should be on the machine and not on the man, but there is no doubt that certain individuals are more prone than others to accidents. The fact remains that the responsibility should be mainly the employers. It has been stated by the American Bureau of Labour that 85% accidents are preventable, which shows that much can be done by management to protect workers against themselves. Factors involved are shown in Fig. 9.

FIG. 9.

### How to Attack the Accident Problem.

*Organisation—* Get the safety idea into executives.  
Join National Safety First Organisation.  
Check frequently to ascertain if first aid equipment and accident reports are correctly kept.  
Organise first aid help for hours when normal routine is not working.  
Fix departmental responsibility for accident prevention.  
Personal management investigation of each accident.

## PERSONAL PROBLEMS OF MANAGEMENT

- Educational—*
- Form small group of executives to make periodic tour of departments and report on conditions.
  - Impress on tool design staff importance of designing for safety.
  - Institute simple tests for new workers.
  - Avoid excessive working periods and temperatures.
  - Give to each new worker your aims relating to accident prevention and first aid facilities given.
  - Emphasise need for treatment of slight injuries.
  - Constant look-out by departmental superintendents for unguarded machines or dangerous conditions.
  - Pamphlet notice boards with constantly changing notices.
  - Scheme giving loss of efficiency bonus to setters and superintendents for every preventable accident.
  - Visits by departmental superintendents to lectures and other plants.
  - Instil in all workers need for tidiness and cleanliness.
- Safeguards—*
- Consider safety aspect of each new machine before purchase.
  - Consider safety aspect of each new jig, tool or gauge before manufacture.
  - Make guards strong and foolproof.
  - Prompt repair of damaged guards.

### Principal Causes of Accidents.

				Manage- ment	Workers
<i>Author's allocation of responsibility</i>	Defective structures	...	...	10	—
	Defective machines	...	...	10	—
	Insufficient room	...	...	10	—
	Absence of safeguards	...	...	10	—
	Unclean conditions	...	...	5	5
	Insufficient light	...	...	10	—
	Lack of good air	...	...	10	—
	Unsuitable clothes	...	...	5	5
	Carelessness	...	...	—	10
	Fatigue	...	...	5	5
	Bad mental conditions of workers	...	...	3	7
	Ignorance	...	...	5	5
	Lack of co-operation	...	...	5	5
Total % responsibility				68%	32%

### Heating and Ventilation.

What can I say other than the opinion that both should be maintained at near normal all the year round? Unfortunately, few plants have afforded air conditioning plants and heat control to such an extent, and one invariably finds certain departments working under conditions not conducive to efficiency. I have no personal figures to give you on the increase of efficiency gained by improved conditions, but my own physiological reactions guide me a long way. I recently mentioned accidents, and an analysis has proved that as temperatures rose above 67° F., the relative frequency of accidents rose, so that here at least is one good reason for control of working temperature. See Fig. 10.

FIG. 10.

### Advantages of Good Heating and Ventilation.

- Efficient heating* More work produced, due to worker feeling more comfortable.  
 Make worker more alert to accident prevention.  
 Stimulates sluggish workers to more prompt start in mornings.  
 Eases sluggish machines and speeds up morning output. Also reduces power required.
- Ventilation—* Keeps workers healthy and cheerful by ensuring constant supply of un-used air.  
 Makes workers more alert to accident prevention.

I have never been able to ascertain why there should be such a difference between staff sanitary arrangements and those for factory people. I consider it money well spent to provide decent conditions for both sections, with a well organised system of cleaning work established.

I am rather a crank on the subject of cleanliness and tidiness. I hold the view that in general a clean and tidy worker is a good worker and that the provision of a clean factory is an encouragement to good work. As long as men are men their productivity will be increased by working conditions which affect their goodwill. One problem here is whether better results are obtained by making each departmental head entirely responsible for the cleanliness of his own department, including lavatories, cloak rooms, passages, etc., or by having a central cleaning department. I favour the former and it might be a good plan to each week make a different head responsible for going around the whole plant and reporting on such conditions. It would be interesting to hear views on this.

Burglaries do occur, and it is advisable that the position regarding employees' losses are known to all. I have known of cases where certain workpeople not covered by insurance lost considerable

property from tool boxes and the subsequent recriminations could have been avoided if the policy relating to such had been laid down.

I may find that the factory is a closed or open shop, a federated or non-federated one, but all past labour troubles and settlements should be turned up and analysed so that an understanding of the present position is obtained. I have, in general, no objection to discussions with trade unions, but I feel strongly that any questions for consideration should come from within, at any rate, first of all. I have always impressed on workpeople the fact that I am available for any discussion on any point providing the departmental head has first been notified, and if a man or men have a grievance, to air it internally before bringing in the union official.

Stabilization of labour is an ideal we all strive after, and here again past records of labour turnover should be obtained. A high labour turnover is a direct indication of inefficiency. (See Fig. 11 for definition and points arising). Sargent Florence estimated that £100,000,000 is lost in Great Britain alone due to this cause, which is not usually shown by normal accounting methods.

FIG. 11.

### Disadvantages of High Labour Turnover.

$$\text{Labour Turnover \% defined as —} = \frac{\text{Separations from factory during year}}{\text{Average working force during year}} \times 100$$

Newcomer works at less than normal efficiency during training period. Consequently cost of unit production increased.

Newcomer usually does not reach standard of quality during training period. Standard of production therefore decreased or scrap cost increased.

Supervision of newcomer during training period takes up disproportionate amount of time with consequent neglect of normal duties.

Incidental costs of employment, wages, and similar departments increased.

Team spirit and loyalty to firm weakened through insecurity of position.

Directors often want drastic action in times of slackness but I have always found that it pays to assert myself and to arrange

for a more gradual release of surplus labour in such cases. Few activities call for more direct vision on the part of the manager than the need for well considered adjustments which arise from rush or slack times, particularly the latter. A wholesale lay-off of work-people generally results in damping enthusiasm, weakened loyalty and loss of morale. What are you to do, you say? Well, it depends on conditions, but for goodness' sake speak up when you get to these sales policy meetings where people with much optimism and little production knowledge are apt to throw the output graph into a scenic railway. Your job is to fill in the valleys with material from the peak; in other words, even out the production load, and your success will depend on your powers of persuasion.

We are told by economists that employees released by improvements in production efficiency are re-absorbed by increased production due to reduced selling costs, or giving better value for money. There is, however, in practice nearly always a lag and one may be faced with the possibility of reductions. I have previously mentioned that even the laying off of a junior should not be undertaken lightly. We are all, I am afraid, apt to become hardened and not to realise the minor and sometimes major tragedies we initiate. Consider every possibility before releasing an employee and don't forget that efficiency is not always the primary consideration—a little sentiment is always worth its place in the scheme of things.

The problem of estimating the innate abilities of the individual being is as old as our race. Much work has been done recently on formulating tests to apply to prospective candidates for jobs, particularly to younger people entering industry. These, like every other test applied to human beings, are not 100% satisfactory, but I feel strongly that they are a step in the right direction.

How many of us have applied for jobs where we have had more than the usual questions put to us, often by a junior executive? Even now, many of us are inclined to engage personnel on the principle that the best way is to try it for a while, then keep on, or sack, as the case may be. This is not fair to either party, either morally or economically, and I do feel that although many firms cannot afford to send all or any employees to specialists for report, we can each advise our own tests calculated to bring out the specific information required. I say "specific" advisedly, because the requirements for one job may be quite different from another. In general, although it may sound too obvious to certain theorists, we should attempt to test on the work to be done, in contrast to the method of choosing footballers where the golf handicap is, I believe, of primary consideration. Many of us pride ourselves on sizing up a man at the first interview. Well, remember what Duncan says in *Macbeth*—"There's no art to find the mind's construction in the face." Beyond that I will say no more.

The possibility of an individual being too intelligent for the position to be filled is one which many of us have found. (Such individuals are like dammed streams and many a communist has been born from such ranks). Seriously, however, this problem often arises but there *are* ways and means of ascertaining the existence of such people. Suggestion schemes, follow up of evening school reports, reports from departmental superintendents and other methods, will usually bring hidden genius to the surface, and the rest is up to management. None of us are, I think, embarrassed by a preponderance of outstanding men. In leaving this extremely important section I would like to put it to you that, whatever else is done, the choice of staff, surely the life blood of your business, should not be left wholly to a junior executive.

Fig. 11 has defined labour turnover. It can be taken for granted that the lower this percentage is the better the conditions in the factory. I mentioned earlier that many of us are administratively lazy and often take the course of least resistance in engaging and releasing labour. The losses from such a course must be enormous in the course of a year and if we paid as much attention to employee training time as to machine set-up times we should, I feel, benefit not only industrially but socially. I recently estimated that with labour similar to that employed in my own plant the cost of engaging a new worker is approximately £11, this including lost output while working up to standard. Assuming a factory with 1000 employees and a labour turnover of 30% you get a loss of £3,300 per year due to this direct cause.

The best place generally to look for a man for a higher post is in your own organisation. There is little so discouraging as seeing all the vacancies going to outsiders. It is, of course, a possible reflection on you for not having any faith in those inside, or having no training scheme in existence from which to draw recruits. In other words, it shows a lack of foresight and judgment in choosing juniors. Whenever a youngster applies, ascertain if any of his latent characteristics and ability will eventually enable him to fill a more important position. If they are, engage him and your investment will give you more than 5%.

### Incentives.

Before I discuss incentives in their various forms, I wish to say one thing. Do not consider any general incentive scheme for the workers as a short cut to overall efficiency. Many managers fly to incentives as moths to a light but in my opinion there are many questions to be considered and settled in any re-organisation scheme before incentives. To successfully run such a scheme assumes, in my opinion, reasonably standardised conditions and the

house must be set in order as a preliminary. Then and then only can you approach payment by results with every confidence.

I suppose there are as many schemes as factories, and I don't propose to discuss any in detail. I will, however, say this, that incentive schemes are well worth while, both to employer and employee, and most of the troubles experienced in the past have been due to directors and managers allowing rank theorists to experiment with crank schemes at the worker's expense. No efficiency work will ever be successful if it does not earn for itself the approval and satisfaction of the worker. Regarding details, I would say that one of the most important features of any system should be simplicity and I favour straight piecework on a time basis as being the best system in present use. Fig 12 may be of interest in showing things to avoid when instituting an incentive scheme.

FIG. 12.

### Why Incentive Schemes have Failed.

<i>Operators</i>	Incentive scheme too complicated.
<i>uncertain of</i>	Shop conditions not standardised.
<i>their bonus</i>	Excessive non-productive work by direct labour.
	Non-repeat operations.
<i>Vagueness of</i>	Operation layout not planned.
<i>task</i>	Operations not suitably sub-divided.
	Ambiguous meaning of what rate covers.
<i>Quality</i>	Failure to pay for good work only.
<i>neglected</i>	Insufficient inspection.
<i>Unfair</i>	Set for exceptional operators, not average.
<i>ratefixing</i>	Set by guesswork.
	Constancy of rates set not guaranteed.
	Unfair by comparison with other jobs.
	Bonus times reduced as operators become more efficient.

I believe there is a movement on foot in America at the moment in favour of controlled daywork, whatever that might mean. The scheme is apparently to record a time or rate on each job but to give no bonus if the job is performed more quickly, the departmental superintendents being expected to maintain the individuals' outputs. Such a scheme might be satisfactory with a conveyor assembly or where the output is more dependent on a machine cycle than an operator, but it does not, in the majority of cases, seem to give any greater control of factory cost than plain daywork, which, by nature of its varying batch costs, is unsatisfactory.

Regarding group bonus, in general, if a worker has to divide his reward with one or more of his fellows, unless they are similar in



skill and capacity for work, the output falls and dissatisfaction reigns. From this it follows that the larger the group the less successful and efficient it will be. I have known of successful group bonus applications, but invariably the operators have been few in number and skilled. The less skilled they are the less the chance of success. Many people hold the view that in a group it is best to put a pace-maker, that is, a really good worker, to spur on the others. Well, my experience is to the contrary. He will invariably, unless of very strong personality, scale-down his output to the others. Men of fairly even capacity in the same line should work together, if they are to pace one another effectively.

The question of staff bonuses is a very old and controversial one and personally I believe that some such scheme is worth while, while not so productive of results as with more unskilled workers. I am at present developing some such idea which will embrace departmental heads, such scheme having as its basis a budgeted allowance to each superintendent for each and all expense *directly* controllable by him. Note the "directly." This is, I think, important as there seems little to gain in dragging in factors outside his control. These budget allowances are based on past working, tempered by experience in other companies and these allowances vary with the departmental output. Thus, the superintendent knows at any time what his expenses should be at any given output.

One of the chief difficulties experienced is in assessing the output in suitable units. This may be simple in the case of a continuous assembly line, but is not so easy as, say, a shipyard or heavy machine shop. Where possible the assessment should, I think, be made weekly but in the manufacture of large units possibly a much longer period may be required.

Summing up, I might say that although most of us would probably work that little harder if the pay cheque showed the difference, when we reach positions of authority we do not re-act to such incentives in the same manner, and our reward is often in the mere accomplishment, with a satisfactory fixed salary.

The payment of incentive to day workers, such as storekeepers, toolmakers, and inspectors, is a problem that often arises. Ever since I have been in the business I have heard complaints that the less skilled bonus workers walk home with a heavier pay packet than the skilled day workers. No doubt the comparative shortage of skilled labour to-day is the result, but the answer is not so evident. We should of course, if in the federation, pay to a certain scale, but it invariably means that we must pay such men their "opportunity value," in other words, what such men can get elsewhere, or get the work done by less skilled workers, plus expensive equipment.

There is one point of interest here. In a considerable number of cases known to me bonus men have been willing to sacrifice several pence per hour on their basic rate, plus bonus, for what they consider promotion to the inspection or similar departments, where piecework is not worked.

I have referred to the difficulty experienced in fixing a suitable incentive scheme with such people as inspectors and other indirect workers. To make matters more difficult, these people are often fairly directly in the production line and consequently one gets the ambiguous situation of spurring one link in the chain and ignoring the next. I believe many jobs now performed by such people could be reduced to routine and consequently rated. Perhaps in the case of inspectors one could pay for rejects as well as passed parts so that there would be no incentive to put through bad work to swell the numbers. Their bonus could also be tempered by bad work found in assembly departments.

Another method of relieving such bottle necks I have found very satisfactory is to put the better of such indirect workers on the staff and pay them weekly, but not for overtime. I well remember a test department not on bonus, where considerable overtime was worked to keep pace with production. These people were promoted to the staff at slightly more than their normal weekly wage but definitely less than their average actual wage which included overtime. Within a short time overtime disappeared but production was maintained.

I would be interested to hear further views in this problem of indirect labour incentives, but before I leave the question of remuneration I want to say that I am a firm believer in paying the market rate, plus, as not only do you tend to get the best labour available and consequently get your money's worth, but you also tend to keep it. Putting it another way, it is not the cost of labour per hour that matters but the cost of labour per unit produced.

I should like to say a word about suggestion schemes. These have often been put in and almost as often dropped out, the only results being a few rude anonymous letters. Some months ago I made the suggestion that we ask fortnightly for suggestions on specific subjects, thus giving the workers a lead. The suggestions have gone up by as much as 75% in two months, and the standard has risen considerably.

One last problem in connection with payment of labour is this one of restriction of output. We allow a worker to earn perhaps 25% bonus but we often feel that many could earn more. How can we encourage them to do so? I feel that the history of incentives gives us the reason for the restriction but how to get a change of heart is not so obvious.

Can good working conditions be regarded as part of remuneration? Can welfare work in any way be regarded as additional wages? My own view is *NO*, when the normal rates offered are less than market standard. Those of us who pride ourselves on the conditions in our factory should take an added pride in the fact that such amenities are absolutely additional to wages paid, the latter being capable of standing on their own without the added benefits provided.

Insufficient attention has in the past been given to the human side in this mad rush for so-called efficiency. You and I know of cases where people have been willing to accept and to continue in positions for less money than they could obtain elsewhere because of the good conditions they enjoy, which is proof that although money means a devil of a lot is it not everything to many. Workers are quick to react. Pride is taken in efficient surroundings which is reflected in quality and quantity in the long run. Equally important, such considerations tend to produce the group spirit, apart from the purely individual point of view, a very desirable state of affairs, particularly valuable where that occasional special spurt in the production programme is required.

Before leaving this section of my talk I would like to state that although in immediate post-war days, technical development progressed to an amazing extent, often to the exclusion of labour considerations, during the past few years much work has been done to emphasise the labour aspect of industry. There is, however, in my opinion, just a possibility that we are going too far in our assumption that the human being can be dissected, analysed, and explained away in so many scientific phrases. I suppose man is the least encouraging of the subjects for standardisation, and efforts to make every individual act in precisely the same way are doomed to failure.

### **Production Control.**

I have mentioned my ideal organisation chart. I want now to say a few words about the production control department. This department, I consider, as a whole, to be the heart of the big factory. If ever it pays to get good men, it pays in this department, and I consider it foolish to economise here. Think twice before putting a man into it but when he is in and satisfactory he is darned good investment.

I am not going to say much about actual factory systems, as the subject has been discussed many times. I will say, however, that an ounce of planning can save a pound of doing, and although even planned production goes wrong and has to be put back on the rails sometimes, with the "plan as you go" idea, there aren't even any rails! This does not imply any lack of faith in the production depart-

ment superintendents but provides each with more opportunity for control of quality and quantity, releases him from extraneous matters and gives him a common target at which to aim, such target being set by a central authority in relation to other departments.

The above may seem very obvious statements but in the minds of many, I am sure, there is a certain contempt for so-called office control. An example is stores record department. In many factories this department is the butt of most remarks, being blamed for many things outside its jurisdiction. My own experience has been that such a department well organised is a tremendous help in production control.

### Oncosts.

The problem of oncosts is a big one. Directors use it as an argument whenever they feel sore with production department, whatever the circumstances, and one can estimate with accuracy that out of every three discussions with the managing director, two are on this subject. Broadly speaking I suppose one can define oncosts as selling price less profit (if any), less direct standard material cost per unit, less direct standard labour cost involved in manufacturing the material into the finished product. Fortunately we production people are not usually concerned with aspects such as sales oncosts and very little with material costs, but we have quite enough to worry us in our own sphere.

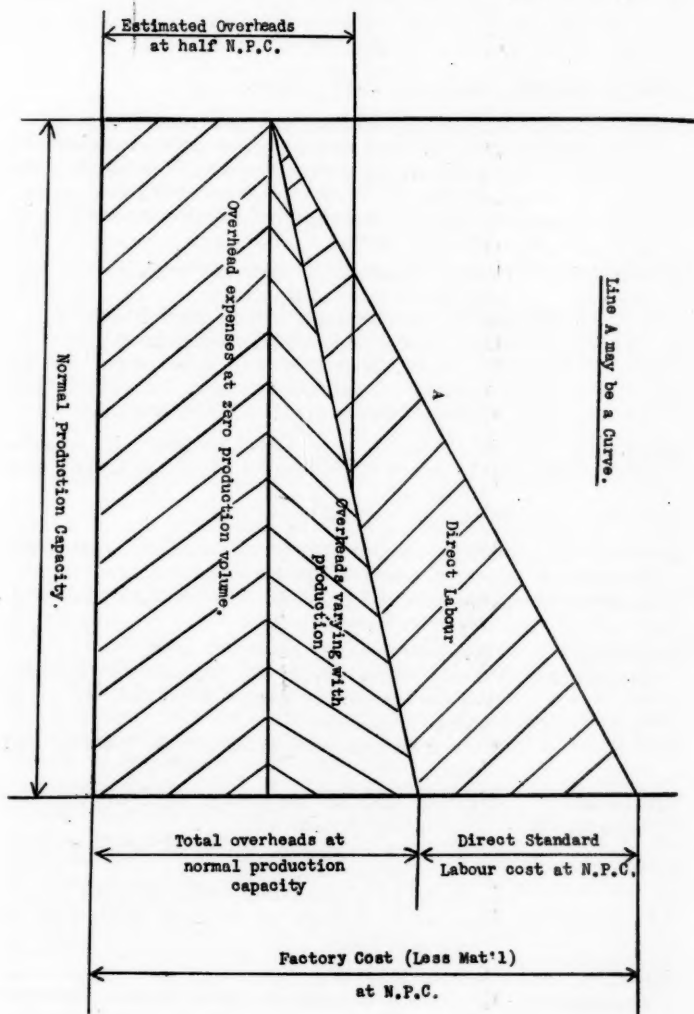
One problem is the ratio between indirect and direct labour. What shall it be? What, for example, is the average ratio of inspectors to producers in a certain type of plant? Unfortunately, so many factors, such as the class of product and its quality, affect the question that comparisons are difficult to make. I would suggest this subject as a suitable one for further discussion in our Institution. At the present time there is a lack of information on this subject that is regrettable.

Another aspect of this problem is that where, owing to reduction in size of departments, the indirect labour shall also be reduced. This sometimes means that in a small firm, such people, to preserve a correct ratio, shall be cut in half, which is physiologically inadvisable. You then get the condition where a department bears a high indirect load, and the ratio looks bad. It is feasible to plot a graph along the line of Fig. 13 which is a valuable aid to management and departmental superintendents when the direct labour fluctuates up and down.

It has often impressed me to witness the colossal thought put into direct labour operations and the comparatively little into indirect operations. I believe that if careful study is given to indirect

PERSONAL PROBLEMS OF MANAGEMENT

FIG. 13.



work the costs could be reduced very considerably. Fig. 14 gives a number of suggestions to which you could no doubt add many.

FIG. 14.

### How to Reduce Indirect Labour Costs.

<i>Stores</i>	Provide requisitions in ample time.
<i>Department—</i>	Pre-pack small items, such as nuts, in packets, to avoid counting when issuing. This may be done by boy labour and will save much time.
	Provide ample supply of suitable containers for issue purposes.
<i>Machine</i>	Correct inspection of materials worked.
<i>Shops—</i>	Keep batch sizes to maximum.
	Keep ample supplies of well-ground tools.
	Have regular inspection of equipment.
	Plan work preferably two jobs ahead for all machines, organise machine inspection and upkeep plan to avoid compulsory breakdown.
<i>Assembly</i>	Deliver parts to convenient positions and heights.
<i>Departments—</i>	Make every endeavour to provide constant flow of parts.
	Mechanise manual operations.
<i>Receiving and</i>	Provide ample supply of standard containers,
<i>Despatching</i>	cases, and packing materials.
<i>Department's—</i>	Mechanise department to avoid manual lifting, shifting, loading.
<i>Inspection</i>	Time study routine inspection work.
<i>Department—</i>	Provide ample supply of inspection equipment.
	Provide system of gauge inspection to avoid errors in standard.
	Fix comprehensive specification for material and parts.
<i>Maintenance</i>	Organise machine inspection plan to minimise
<i>Departments—</i>	compulsory breakdowns.
	Keep down individual makes of equipment for ease of repair and service.
	Keep stocks of constantly replaced items.
	Keep ample supplies of standard items such as nuts and bolts.
<i>Office</i>	Mechanisation.
<i>Departments—</i>	Establish standards on such routine items as Posting/Typing, and set standard performances.

*Cleaning—* Time study routine operations such as window cleaning and floor sweeping.  
 Avoid fittings requiring constant polishing.  
 Provide ample rubbish containers (portable).  
 Provide suitable trucks for rubbish containers.  
 Provide incinerator and recover waste heat.

One of the most frequent grouses of departmental superintendents is that they do not get the necessary information promptly on how their costs are running. They are usually justified! The solving of the problem is another matter, and I suggest that one of the questions you should ask when a modification to the factory system is proposed is: "How long does it take to complete the cycle of action?" One might judge the efficiency of an office by the delay in producing reports.

Just here I might quote from a paper given in 1934 on Production in Engineering Works, by I. C. Green, North East Coast Inst. of Eng., 1934: "It does appear rather elementary that the works department should be constantly under analysis of costs, while other departments appear to escape such scrutiny, and as a result, are definitely well below works or machine shop efficiency."

The problem of plant replacement is a sticky one, except to the machine tool salesman. Some time ago I suggested that our Institution make an attempt at giving us a lead by studying the problem and analysing, if possible, all the variables. I also read a lecture by Mr. Perry Keane given to Birmingham last season, but I am afraid I was left still groping. No doubt we can use a formula, but there are so many varying factors at present. One problem is this question of how long a machine should take to pay for itself. So many different figures, from six months to ten years, are used that it would be interesting to realise how such times are determined. I am willing to guess that the average age of machines in most plants is much longer than the period used when determining new machine economics, which seems wrong. What would happen if we replaced strictly in accordance with book values?

Another problem, bound up to a certain extent with oncosts and machine capacity is the one of—"to make or not to make." A part is now being made outside; would it pay to make it within? In your estimate of cost, should the full departmental value of oncosts be charged against the job, bearing in mind that you may be utilising existing plant to a greater capacity by bringing the job inside. Again, if you have to purchase additional plant for it, should the full charge be allotted? Should not many charges which are already existing modify the additional job and machines. Fig. 15 gives some sides to the problem of home manufacture.

Batch size is another problem which I believe it would pay us



to study a little more fully. I have always found it difficult to hold the balance between the machine shop superintendent who requires very large batches and plenty of time to produce them and costs department which requires a minimum of work in process and little stock. There are formulae in existence for working theoretical batch sizes but I don't suppose one factory in a hundred uses them.

FIG. 15

### Whether to Buy or Make.

*Advantages  
of buying—*

Quantity may be too small for economic manufacture?

If financial resources are limited, this may be better invested in stock than equipment for manufacturing.

Can higher quality obtained from specialist more than compensate for higher cost?

*Advantages of  
making at  
home—*

Outside purchasing may enable those firms to undercut similar articles to competitor, or to quote more favourable terms to service users.

Favourable outside markets may be temporary, or is there a danger of monopoly?

Rush orders can be more easily controlled and filled.

Should we gain anything by investigating these problems more thoroughly? My trouble has so far been mainly that however much I work to a formula, the supplier of the raw material has persisted in letting his delivery date equal X, which, as you know, represents the unknown. Consequently I have been forced to disregard theory and use the good old fashioned methods to get the work through. This doesn't mean, however, that the problem is not worth investigating.

### Technical Problems.

I am a very firm believer in getting, not only first class human material but first class raw material into the factory, and consider much good can come from thorough investigation into goods inwards inspection facilities, and while aware that it is often done I believe that it would pay us to loan to suppliers in many cases duplicates of our own checking facilities, which in the case of such variables as casting and stamping forms, centres of bosses and holes, and location point positions, would be of real value. It would of course be advisable to make a proviso regarding possible damage to fixtures, etc. Such facilities would, I am sure, reduce much heart-burning by purchasing, progress and rate fixing departments.

I have nearly always found difficulties in relationships with research departments and the more brilliant the research staff the

greater the difficulty. One of the snags is that they have so many ideas they do not know when to stop for a production breather. It sometimes pays to make out that production is less flexible than it really is.

The above statement is linked up with alterations, which, like the poor, will always be with us. It always pays to institute a really good system to deal with these, as it gets so much use. One difficulty I have found is that the people originating the alterations do not realise that those who actually have to apply the alterations cannot spend the time on the applications and consequently should have all the spade work done for them and instructions made perfectly clear.

Production engineers do not, as a rule, complain of the complexity of products, but I have often found myself in the position where I wished those responsible for taking on orders realised more fully the dangers of too much complexity. Line after line gets taken on, often requiring extremes of accuracy, plant and workmen, and it is a moot point whether such complexity really pays. I think many companies would benefit by wholesale pruning of models and types of product, tempting though it is to have such a wide range. Under the heading of technical problems I include the subject of mechanisation. I am not embarking on a dissertation of its social aspects, because I don't understand them (all economists have a different view), but the manager should, I think, make every effort to bring his plant to efficiency, and mechanisation is an important section of such activities. Fig. 16 may interest you.

Fig. 16.

### Mechanisation Advantages.

<i>Reduction in manufacturing period—</i>	Investment—labour costs (work in progress). Investment—material costs (work in progress). Cost of storage in stores. Cost of storage (work in progress).
<i>Possibility of quoting shorter delivery dates—</i>	—
<i>Possibility of using same Factory area for greater output—</i>	—
<i>Greater flexibility for changes of design—</i>	Motorised machines. Interchangeable benches. Movable shop partitions.

*Performance of  
work unsuited  
to human  
labour—*

*Increase in  
quality—*

New methods improve quality.  
Less handling due to shorter manufacturing time.  
Reduction in human errors by:  
Rapid sorting and  
Rapid checking.

*Reduction of  
internal trans-  
port costs—*

Chutes.  
Conveyors.  
Elevators  
Runways.  
Trucks.  
Tubes.

*Reduction of  
indirect  
labour—*

Production control offices by—  
Speeding up of clerical work.  
Stores by—  
Mechanical packing and  
Mechanical handling.  
Inspection by—  
Mechanical methods.

*Labour-saving  
machines—*

Grouped controls for ease of action.  
Power manipulation of machine.  
Quick movements between cuts.

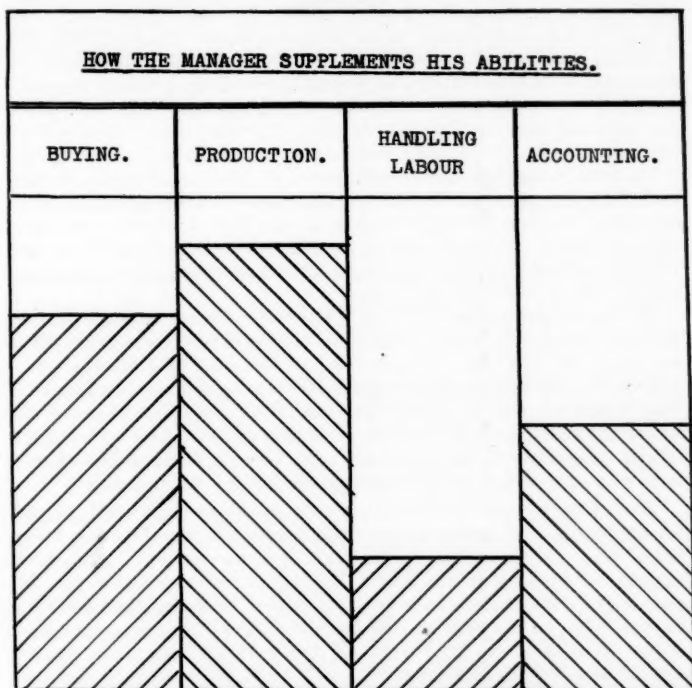
*Labour-saving  
tooling—*

Ease of loading and unloading.  
Duplication of tooling.

**Managerial Functions.**

Now what about the manager himself? Are there any changes he must make in his own outlook on things now that he occupies the manager's chair? You have, no doubt, all seen the advertisement which states boldly "Man know thyself." Well the writer must have been a works manager. Endeavour to analyse your own strengths and weaknesses and graph them; if you are honest you will be surprised. What are you going to do next? Well, balance is essential and either you build up your weaknesses, which it is difficult to do much more at your time of life, or you build your organisation to help those weaknesses, until you are reasonably satisfied that the company is covered all ways. Managers, it is said, are successful in proportion as they have been able to surround themselves with men who supplement their powers. Fig. 17 illustrates my point.

FIG. 17.



In this diagram the shaded portions represent special abilities possessed by the manager in their relative degrees.

By employing other men (shown in unshaded portions), gifted with abilities to counterbalance his weakness, the manager provides a well balanced organisation.

The finding of such men is a first class problem, and it is here that the manager should, if anywhere, be firm. So many firms drift on, with the realisation that wrong men are in certain key jobs, and the longer they drift the harder it is to correct. No manager can jeopardise his company by retreating in the face of personnel trouble, difficult though it may be to act. I can honestly say it is better on many occasions to pay a man to keep away rather than have him pulling back his department and keeping out a better man. Make certain, however, you have the better man available, and if

you refer to my previous remarks you will realise how important it is to have in the background a nucleus of really good men, even if you have to temporarily make work for them. Many a good firm has emulated the camel, lived on its fat (or is it water) and forgotten to replace it until too late. Don't remind me of my previous remarks on sentiment in business. The more you see that you have keen and efficient people working for you, the more you can afford to be sentimental.

No talk on management would be correct unless the listeners were told that the manager should get rid of detail. Well, this talk is no exception because the injunction is no idle one. Unless he can, to a certain extent, sit back and survey the scurrying crowd of drones with a reasonable air of detachment he cannot get that broad picture which it is so essential he should get.

If I was asked to describe briefly the three steps a manager should take on promotion they would be : (1) swap his microscope for a telescope, (2) swap his desk for one half the size, (3) have the scrap pile located outside his office window. This getting away from routine does, however, not mean that the works manager should never dig under the surface. It is, I think, *absolutely essential* for every change of any magnitude to be personally supervised by him and he should fade out only when completely satisfied it is running well.

From time to time he should dig into what one might call "significant details" to assure himself the business is not growing away from him. A series of reports from various sources is the best manner of keeping in the know, but let those responsible for the running of departments have equal facilities for seeing the necessary figures, even to the finance side in case of scrap, upkeep costs, etc. Many companies are frightened to death at allowing such figures out of accounts department.

One of the most important things a manager must realise is that organisation is only a means to an end, not the end itself. His sole concern is to turn out the product in the quantities, time and qualities required and this must almost be the primary viewpoint. This sounds terribly obvious but is I am afraid not always realised. Consequently, every stoppage of the production machine at the business end should be personally investigated and the necessary lesson learnt ; it is certainly not beneath your dignity its why you are there.

His personal conduct and habits must be of a high standard, His spirit, courage, optimism and initiative must set the pace of the organisation and he should be accessible to all as a final appeal. The latter is sometimes a problem and every care should be taken to see that departmental superintendents are not given the impression that you are investigating behind their backs. The fact, however,

that everyone has the right of final appeal, even to the managing director, will make responsible people think much before acting. One aspect of this is worthy of notice. What should the manager do when at the inquest he feels that a man has been sacked unjustly?

Close attention to the foregoing points will enable the manager to feel confident of his organisation but I would emphasise that at no time is the quality of the manager brought out as in times of emergency. The better he is the less they know of emergencies, but many are beyond his individual control. Reference to Fig. 18 shows some of the problems of this nature which arise from time to time.

FIG. 18.

**What the Manager can do about Emergencies.**

*Keep a lookout on such sources of trouble as:—*

<i>Natural—</i>	Storms and floods. Drought. Conditions causing shortage of supplies or of the commodity on which depends the buying power or the demand of your trade.
<i>Political—</i>	War. Government regulations.
<i>Economic—</i>	Depression. Shortage in money and wealth.
<i>Social and Personal—</i>	Neglect of public goodwill. Labour supply. Agitation and strikes. Failure to maintain trained organisation. Lack of skilled men and under-studies. Personal clashes and shortcomings. Accidents and illness. Neglect of welfare.
<i>Structural and Mechanical—</i>	Poor design and selection of buildings and equipment. Fires. Breakdowns and delays. Poor maintenance.
<i>Materials and supplies—</i>	Failure of sources. Lack of foresight in purchasing.
<i>Administrative—</i>	Vague definition of responsibility. Failure to detail a man for certain jobs. Carelessness and failure of discipline. Wrong and antiquated methods.

*Trade and  
Finance—*

Over retrenchment.  
Shift or failure of demand.  
Neglect of goodwill.  
Lack of balance between price and quality service.  
Poor sales methods.  
Collection difficulties.  
Cut-throat competition.  
Resourcefulness of competitors.  
Financial mistakes.  
Excessive unknown costs.

*Determine Action Necessary—*

Carry Insurance against all possible emergencies.  
Shape course to avoid others.  
Analyse conditions and alter course to meet remainder.  
Organise to avoid repetition of crisis where possible.

Should departmental heads be encouraged to use their initiative? I knew a works manager who would get annoyed if he found out that any of his superintendents made some change without consulting him and would get equally annoyed if it was suggested to him that he should discuss any change with his managing director before action. Is there a difference? Actually, very little, and I felt that there were faults on both sides. The managing director is as entitled to know developments as the works manager and I personally make a complete report each month to my managing director, although he can see most results from other information supplied.

Department superintendents should be encouraged to use their initiative up to a point, the limit being reached where any action taken would affect the works' system or rules, or would set precedents affecting other departments. Similarly, on broader lines the works manager should proceed cautiously if any action proposed would affect any other department than the ones he controls. Departmental superintendents should be encouraged to consult freely with management but it should be insisted upon that any schemes put forward provide details fully worked out. So many proposals cannot be substantiated on analysis.

I have already mentioned wage and salary increases. It is, I think, advisable to lay down set times of the year for salary increases and to very carefully investigate each put forward. The closer the investigation the more a man realises what a rise infers. Don't pass the buck to the directors on any point, but stand on your own ground if you have to turn down an application. I can sum up my opinion on salary increases by saying: "Pay well and expect much!"



Rest periods for workers have been discussed for years. In my own factory we allow two ten minute breaks during the day and have found that no reduction in output has been experienced. Some say they are not worth while but I believe that if some of us who now sit in an office a good part of our time, stood in front of a machine or bench again for hours at a stretch, we should change our minds. Incidentally, is it not rather peculiar that the harder the manual work the longer the hours of work. There is, in my opinion, a terrible amount of bunk talked about the shorter hours required for office staff on account of brain fag.

Many workers like overtime although they won't admit it. It is, however, inefficiency against one department or another and should be closely controlled. The works manager should get details of overtime to be worked every afternoon and should get the actual time worked for comparison. This often enables it to be avoided by making the departmental superintendents think beforehand. As far as possible every employee expected to work should be notified in time to let him tell the people at home and in the case of week-end work, by Friday evening. It is, I think grossly unfair to tell a man at 5-0 p.m. that he must work late.

The problem of paying staff for overtime I definitely oppose unless carried to excess. A nominal allowance for tea only should be made Saturday and Sunday work I abhor. You probably know of the foreman who said "he didn't believe in giving eight days pay for seven days work for six days output!" I have heard of cases where a departmental head has had a wage increase application for a man turned down and has let that man work consistent overtime to prevent him leaving.

Many works managers find on going to a new firm that there are weak spots in the personnel. It is a great temptation to bring in key men from your old organisation but this is, I think, open to grave doubt. It antagonises the other people and makes cliques. Far better to spend much trouble on getting together a new staff or to wait some time before bringing in a man who worked for you at your last job.

Introducing the new man is, I feel, a much neglected job. Invariably he gets stuck on to a desk or board and given a job right away. I think it would be beneficial if each new technical staff member was given at least a week to wander through department by department being introduced by each departmental head to the people who matter and who can tell the newcomer interesting information, and let him absorb the atmosphere of the factory.

This, in a modified scale, is well worth while in the shops and it would be interesting to have views on this.

## Training for the Future.

There is at present an alleged dearth of skilled labour in engineering, due primarily I think to the poor wages and expectations given in recent years. Just recently, however, everybody has gone mad on training schemes, although personally I feel that the provision of an ample supply of skilled workers is to a certain extent antagonistic to the work of the production engineer. It seems to me that the latter has developed his art of necessity owing to the labour situation. I know I tread controversial ground here. Notwithstanding this, there are certain departments where I think it is in the interest of every company to have young fellows in training and I mention the tool room as an example. It can be accepted that generally the value of a man is in proportion to the time required to replace him and consequently all key jobs should be covered. Of course the fewer the key jobs you have the better.

Getting to actual details, I am in favour of a maximum of three years for an apprentice to a specific trade and his wages should be at least up to the standard of youths of the same age not apprenticed. Half-a-crown per week isn't good enough these days. Make entry to these ranks difficult by examination both theoretical and practical and you will never lack applicants. They all appreciate quality in the long run.

For executive positions pick out the best of your apprentices with now and again a leavening of good young men from other sources, and put them through all departments for a period of at least one year. During such time they should receive the personal interest of the departmental superintendent and should be expected to write a report each month and to attend advanced courses at a suitable centre.

It is a good plan to hold a monthly meeting with these young fellows in your office and to discuss fully any points of difficulty. These meetings, I have found, are mutually advantageous. They encourage the trainees to keep their eyes open and they give you very useful hints on things that are going on right at the job, and also to estimate the relative worth of the trainees.

Each point brought up should be discussed in all its phases, because it should not be forgotten that the responsibility is mainly yours to educate these people along the right lines. Before leaving the subject of training, I would like to pass on to you without comment, the following extract from proceedings of the recently formed Detroit Committee on Apprentice Training:—

"A pertinent suggestion made by the Committee to avoid overproduction is to limit the proportion of apprentices to skilled men to a ratio which will guarantee continuity of employment to apprentices as long as the plant is in operation."

### **Welfare.**

Are welfare activities worth while? Frankly I don't know, speaking in a broad sense. Welfare work may be helpful in the hands of a popular man. As I have said before, however, it is only a supplement and the important thing is a fair wage. Make this a "market plus" wage and I don't believe much welfare work is really necessary.

Sports and social clubs, if subjected to strict analysis, show that in most cases a very small percentage of employees are actively involved, particularly in congested areas, and although most are supposed to be self-supporting it is doubtful if they pay. Better perhaps for the directors to organise special functions at intervals and partly defray expenses.

I am not including such services as canteen and first aid in my remarks, as I believe every firm should provide good facilities for these purposes. I am also a believer in compulsory medical examination for prospective employees, which I think is an advantage in a national as well as a local sense.

Well, it is said that it is an accomplishment to make a long story short, but I am afraid I have made it too short and also too long. There are many other aspects of management but I feel that enough has been said to stimulate discussion, and I now await your observations. .

### Discussion, London Section.

MR. HALES (Member of Council) : With regard to our lecturer's reference to the position of a new manager and the art of being able to present an attractive report to his directors, after hearing his lecture this evening I would give him high marks for presenting a case. I would recommend members to pay proper attention to submitting an attractive document when applying for a position, and also when they have got a position. Mr. Puckey also refers to the hidden purpose often behind questions or remarks made by managing directors, and I can support the points made by Mr. Puckey on this point. Always remembering that results count, I would say that provided the manager has the art of setting out a report to illustrate good results he would generally score over another manager without the art of making attractive reports. He might often be chosen by directors for a higher position, such as general manager, if he possessed the art of presenting an attractive report.

Referring to Diagram 17 on how the manager supplements his abilities, while this may illustrate our lecturer's point, I consider that the relative degrees vary in every case according to the individual ability of the manager's staff as distinct from the manager's own ability ; by that I mean that you may find an outstanding man who excels in certain directions, therefore you would be able to give him more responsibility and relieve your own responsibility to apply it in other directions. My own view is that the most successful managers are those with the ability to choose the right men and to delegate the various duties. To merit the respect and loyalty of the staff may, I consider, be best done by personality and by personal contact with the staff, and of course, by example in management problems. Do not be afraid to give your chosen men scope and responsibility and back them to the limit. Make decisions carefully but quickly. Let your keymen see as much of your correspondence as possible. In other words, teach them to make your problems their problems. Mr. Puckey has covered these points in various ways and I would emphasise them.

I know a successful works manager who admitted to everyone that he was not a production engineer or technical man. He put his production and technical problems up to his staff to deal with, but he probably had greater ability on these subjects than he advertised. His staff did the work "wagging their tails"—happy with importance. This gentleman had exceptional personality, but the case illustrates successful delegation of duties. The point being that successful management can be attained by a man of the right personality—controlling the reins of picked key-men—expert in

their respective activities. Ability in the works manager to perform any of the duties of his staff is of course a great asset, and to show such knowledge is probably the quickest road to win their respect. But this ability should only be shown on special and rare occasions—remembering that a manager's job is to manage, and not to do the job himself.

Another point I would make is, that I consider management problems are best solved on the spot. Sitting in an office and writing memos without intimate knowledge of the subject matter should be avoided wherever possible. The practice of writing memos—based on system records and figures is rarely effective. It wastes good men's time and is usually hated by a works staff anyhow. Definite instructions should, of course, be written for purpose of record.

With regard to Fig. 16 on whether to buy or to make, I think our lecturer does not sufficiently stress the important point of the advantages of making at home. I refer to deliveries generally as well as rush orders. Many firms decide to make at home, solely due to the difficulty of obtaining reliable deliveries from outside suppliers.

I do not quite agree with Mr. Puckey's view regarding statistics showing a decrease in the number of large factories. He said that this probably shows inefficiency in the large firms or factories. I doubt whether recent figures are a reliable guide, especially since statistics will of course cover many of the new factories which are small. On the other hand I think many factories have increased from 200 or 500 to beyond the 1,000 mark, building up all the time, and certainly very efficiently.

Another point on which I do not hold our lecturer's view is his reference to group bonus. My experience is not unfavourable to group bonus, particularly when manufacturing on "Line Production" where individual bonus is often impracticable. I suggest that success of any system of payment by result is controlled by many varying factors in different works.

Just one further point. Mr. Puckey refers to the problem of plant replacement as a sticky one. This phrase is rather vague and perhaps our lecturer is just inviting discussion on it. I am sorry that time does not allow me to deal with this item more fully. My view is that many of our most successful firms make large profits by installing new and up-to-date machine tools and equipment. It is natural that directors will keep a tight hold on the purse strings, but I consider it a works manager's duty to combat that by submitting a report and figures which justify the expenditure he asks for.

**MR. PUCKEY :** I am very glad to hear that Mr. Hales agrees with me on my opening remarks. I would, however, like to say in

connection with this point of the manager supplementing his own abilities that too many managers have the habit of generalising too much and often they win much more respect by digging below the surface and analysing a programme than by talking in the air about it.

Regarding this question of sitting in an office, I do quite a lot of it myself and I have got quite a number of staff here who will bear me out on that, but at the same time I do not condemn it as much as Mr. Hales does. If one talks and talks about a subject and simply issues verbal suggestions then a lot of these things are simply missed. A man may wake up in the middle of the night and remember that "the manager told him to do something during the day" and then fall asleep and forget all about it. A confirming memo certainly does put the thing in front of the people and prevents them from relying on memory. Personally, if anyone mentioned a matter to me I would much rather they put it down in writing, so that I could put it away in my file and refer to it again, even if it were weeks later. Writing memos to cover up and confirm anything is not quite as bad as Mr. Hales tries to make it.

Regarding making or buying, I did mention the fact, I think at the bottom of diagram 15, that rush orders can be met and so filled more easily at home.

In connection with Mr. Hales's remarks regarding the reduction in the number of large factories, I do not think that has any bearing on it. I said the actual number of large factories is decreasing. The growth of small factories does not bear on that at all.

On the question of group bonus, I can only repeat that I do not think group bonus is very satisfactory. There is a tendency to analyse the group as a whole and consequently you do not get the required efficiency by such a method. If you have a group to study, analyse every element, and then possibly place a group time rate on it. Then you have reasonable efficiency, but so many people regard a group as a group and study it as a group instead of studying the individual elements in that group. Regarding machinery replacement, the only thing I can ask you to do there is to read a leading article, and a very short article, appearing in *Machinery* this week, and I think you will find the position, as I see it, very ably expressed.

MR. GERARD SMITH : My first point is with reference to good will and the introduction of non-union labour. I think that by introducing non-union labour into a full union shop a manager is asking for trouble, but apart from that I think we have no right to decide whether a man should belong to a union or not, just as we have no right to decide his religion. Consequently, labour politics is not our business, except insofar as trouble may be caused among the workers themselves.

With regard to staff increases, it seems to me that Mr. Puckey expects that staff increases shall be given after application by the individual. I think that in no firm should a man have to ask for his rise. It should be periodic—for juniors six months and for seniors annually. Staff salaries should be reviewed at these times, and if then a man is not among the lucky ones he has a perfect right to ask why.

Mr. Puckey states his preference for straight piece work. Although he does not say to the contrary, as a rule I think straight piece work does not include a minimum earning, and I think it is our duty to-day to make sure that the rates which we decide on, be it a union or any other rate, shall be taken at the end of a week. In my opinion, bonus is the best method, not a half time saved or anything like that, but a whole time saved. There are other advantages which will be mentioned later. In the case of a bonus method one always guarantees the minimum rate. If, however, a man after a reasonable time does not make the rate he must make way for a better man.

Regarding group bonuses, I think that where a bonus is capable of division it should be divided. I have several cases in mind where one man cannot work faster than the group because the piece may be handed from man to man, or they are really helpers towards a central machine, in which case I can see no alternative to the group bonus.

With regard to bonuses for service men, there is a possible method for men such as progress men, inspectors, moving men, and perhaps even sweepers and storekeepers. These men are, after all, only there because they are of service to the production unit. If, therefore, you are on a bonus plan and know the average earnings of the unit being supplied, then you can pay these individuals the average rate earned by the shop which he serves. Then they have an incentive. It is no good giving piece work or a bonus incentive unless the recipients can affect the results, but a move man or a service man of any kind can definitely affect results by the effort that he puts in.

With regard to suggestions, I think the greatest objection on the part of an operative to put forward suggestions is because he fears, and in many cases quite rightly so, that those suggestions are taken by those above them and he does not get the full credit. You therefore have to prove to him that an idea is not turned down by one individual who may be jealous of any suggestions, but that it has been duly discussed. A very good way is to have a development meeting of technical people who will discuss all things put forward, so that the operative knows that at least he gets the credit even though no reward may be forthcoming.

Rate cutting has been the evil which has kept payment by results backward for many years. I think we can say that to-day no respectable firm would consider any reduction in rates of payment



simply because the earnings were higher than they anticipated. It is, I believe, a wise thing to have one or two, not too frequent, jobs going through the shop with a definite mistake in them which will pay definitely well, as an illustration.

Office control is very often taken in an antagonistic way by management. Personally I welcome it. Before you start making a thing, you know how it is going to be done. You issue a drawing and that drawing states the operations which are decided by somebody who knows. If there is any evident difference in machines, the individual machine is taken and not the group, and those facts are given to the planning people. It does not concern in the least which job goes on first because the sequence of the jobs is stated beforehand, to get the minimum set-ups, and it is possible to alter the sequence of every job provided that it does not increase the set-up times.

Regarding the method of getting the yard-stick for overheads, there again your bonus comes in. If, as you undoubtedly will do, you produce your piece work payment cards in anticipation of the job, you then have a target and you know that you expect your bonus rates to give a certain percentage increase on the ruling rate, and that is the measure of what you should do. If then you take the costs of your overhead services and plot them against what you should have produced, whether you have produced it or not, in terms of minutes or in terms of labour value, you have a certain measurement of your overhead expenses. If you want to know your sectional overheads you can sub-divide them and still put them against the same measurement.

Bonus payment can, to my mind, eliminate costs from the production control point of view. I have never been in a firm yet where costs come within a reasonable time for the management to take any action, but you can get your labour efficiently in terms of personal bonus earnings the day after. If your piece work or your bonus payments are correctly calculated, as they should be, that is an absolute measure of the efficiency of your shop.

Mr. Puckey mentioned that the manager himself has got to watch what he is doing. Well, here is just a little stunt which may interest you. There are obviously certain figures to see and tests to be made. Have a list in the office on the wall of all the things to be attended to. Initial it in a space provided, so when there is no initial beside an item, go and do it.

MR. PUCKEY: It would, of course, need almost another lecture to reply to Mr. Gerrard Smith's remarks. With regard to non-union labour I must agree with him, but at the same time I want to point out that non-union labour has been one of those things in the past that has caused illwill, and is therefore shown on my diagram.

I agree with him in the main on staff increases. At the same



time you will always get people who ask you. You cannot satisfy everybody. I am afraid that in my anxiety to bring out as many points as possible I did not elaborate this question of payment by results, but I would like to point out that I am definitely in favour of a minimum wage, with piece work on a time basis as an addition to the minimum wage, the savings going *wholly* to the worker.

Regarding the percentage of men on service work I can only state there that I am afraid Mr. Gerrard Smith does not appreciate my point in that direction. I agree that one can get a certain proportion in that sense that you have a certain output and you should be spending a certain amount of money, but who is going to decide the ratios in the first place? That seems to me to be very important. For example, you may have a ratio of inspectors to direct producers of 10% in one firm, 15% in another firm, and 20% in another. Well, who is to say that one is right and the other is wrong? I think that the question of ratio is a most important point. There is a lamentable lack of information on this subject. That is a subject that could be discussed very much more fully in this Institution. These ratios do appear in various firms to vary very considerably.

Regarding suggestions, I would like to just briefly describe the suggestion method in my own firm. We have suggestion boxes round the factory and these suggestion boxes are under lock and key, the only key being kept by one of the accountants in the company. He has little production knowledge, and he is the only man who knows the name of the man or woman sending in the suggestion. About every three or four weeks we have a meeting at which the heads of various departments, production, service, costs, and sales, come in and sit in judgment on all these suggestions. Incidentally the suggestions are broadcast to them as soon as they are taken out of the boxes. Well, we have an opportunity of studying these suggestions and getting to know what they are all about and asking advice on them, and we then decide whether they are worth going ahead with or not. The meeting comes along and we have this man who gets in the suggestions as the secretary to the meeting. He brings them forward and we pass judgment on them. If one is approved we give the man £1 for it. If we do we are then at liberty to know the man's name. If the suggestion has been turned down, however, we don't know the man's name, but at the end of the year a list of the names, is available. At the time I want to say definitely that we have no idea at all of the name of the person presenting the suggestion. It is quiet secret in this respect. I make a point of interviewing the successful ones and congratulating them, and at the same time asking them to win a few more pounds, etc., and it is surprising how many of these fellows say that their pals down in the shop would be willing to send in their suggestions but

they fear that these suggestions will work them out of a job. It is most surprising, but I always try to impress on them that if a man has to go surely the man who puts in the suggestion will be the last person to go. But the fact remains that there is a great difficulty in getting these suggestions and I do think that if we could break down this barrier we could do a great deal of good. At the end of the half-year all these winning suggestions are gone through by the committee and prizes of £10, £5, and 10s. are given to the three best.

I was very glad to hear Mr. Gerrard Smith bear me out on the office control side. He mentioned that you could get the results of the bonuses the next day when the full figures come through from the cost department and I quite agree, although it depends on your system. I mentioned, of course, in my lecture that the efficiency of any system depended on the interval between the job being finished and the results being available and naturally from the efficiency point of view that should be brought down to an absolute minimum.

MR. DYSON : It seems to me that the title " Problems of Management " has been substituted by " Principles for a Works Manager." Therefore as a youthful member I have one or two questions to put to the lecturer, that seem to deal more on management problems.

The first one is, what method would he advocate for fixing the accuracy and class of finish required on the products being manufactured, because obviously management cannot control the cost of producing a product unless this is controlled ? Surely it cannot just simply be left to the draftsman to decide, or even if it is indicated on the drawing, it cannot simply rely on the inspector using his own judgment of when, what, and how to control this. For instance, it often happens that when the factory is rushed inspection is insufficient and when the factory is slack we get excessive inspection, or of course on the other hand a manufacturer of metal toys may have engaged an inspector that was previously employed on scientific instrument work and therefore without some definite standards laid down production costs would look rather sick. Another problem to me is that of outside material supplies, this problem has already been voiced, but how can one solve the problem ? What can Mr. Puckey suggest to try and encourage or by some other means, help to ensure that outside suppliers of material will assist in maintaining the manufacturers initial manufacturing programme ?

Another problem is that of depreciation allowance for machines and capital allocation for new plant. Admittedly this is a rather a sore point but it is definitely a problem for management. Then of course, there is the question of the best method of checking actual costs with budget costs.

A very important point not touched on by our lecturer seems to me to be the checking of actual output in relation to the manufacturing capacity. In fact, it seems to be one of the first problems

management has to solve, its manufacturing capacity, because until this is known one is not aware as to whether the factory is overloaded with work or if they can maintain delivery promises that have been given, or not.

From my experience especially with the smaller size of factory I certainly agree with Mr. Puckey that it is far better for mutual benefit to put the welfare work in the pay envelope.

I have used the method of sending outside supplies, duplicate gauges, checking jigs, etc., and it certainly does assist in getting results. The question of office hours and factory hours interested me very much, I was rather pleased to hear this point raised because in the few years that I was employed in the United States it happened that the office staff started at a quarter to eight in the morning and the works started at eight. I have a little experience with group gang bonus. It was over a small group of ten operators on an assembly bench, this was a new departure and we decided to allow the scheme to run for a period of six months on trial. Unfortunately at the end of six months that gang group was £74 in debt, so personally I agree with the straight price time system, of course guaranteeing the day rate.

MR. PUCKEY: The only comment I can make on the speaker's opening remarks as to the title of my paper is that problems are usually those of maintaining the principles and consequently principles are the things to be studied. Regarding the accuracy of the product you are manufacturing, I agree that apart from the entire elimination of the arbitrary standards such as I mentioned I do not know any way of getting over it, except by argument. I have had many peculiar experiences, for example, where there was a rush of work going through the inspection department and, to get a breather, they would not pass work which they would otherwise have passed. On the other hand I have had instances of the inspection department passing a whole lot of work during rush periods which they would not otherwise have passed. I do not know therefore which is the better policy to adopt.

Regarding the solution of the problem of outside supplies coming in on time, I am afraid that I cannot suggest much more. In Fig. 1 there are the bad factors which have an adverse effect. The accounts department is frequently the cause of stock not coming in on time, but in general, much depends on the efficiency of your production control and purchasing department.

With regard to checking budgetary costs, Mr. Gerrard Smith made some remarks which I think should help you there, and also of course if you have some kind of graph you can plot these costs and see which way they are going. In Fig. 13, for example, it is quite easy to plot the particulars given and estimate what the cost should be at any given time. I quite agree with your remarks with regard

to capacity of the factory. One could of course make a point of checking up on the normal capacity of the factory, but very often you find you have to get a quart into a pint pot. At the same time, however, it should be on record in the production control department.

MR. GOSLING : Referring to the chart, Fig. 17, regarding the works manager's ability, represented in four columns, I would just like to ask you whether you have chosen these particulars arbitrarily or whether it is your idea of the average works manager's proportions. It seems to me that the buying column and labour column should change places and that the costing department should be where the present remaining column is.

MR. PUCKEY : In reply I would state that this chart is rather diagrammatic but at the same time I have placed the proportions in their respective places merely to provoke an argument.

MR. W. A. TOMLINSON : With regard to Mr. Puckey's remarks on the lack of information on the size of inspection departments, of course the percentage increases or decreases according to the methods used. Some firms, for example, inspect after every operation, while others inspect after the product is completed. But I believe Mr. Puckey has answered his own question in Fig. 14, and, if as much attention was given to timing services as there is to timing production then the inspection time problem would solve itself. For instance, the inspection jobs can be timed on a basis of the number of gauges used, etc. It becomes a very difficult matter, however, when the question of judgment arises such as on classes of finish. Even if we put up a sample case and keep it up to date there are always border line cases where controversies arise between inspection and production departments ; and this is where I disagree with the lecturer ; in that the inspection department should be responsible, not to the managing director, but to the works manager, and he should be responsible and strong enough to set the line at any time.

MR. PUCKEY : In my own company we have two inspection departments. One is called the works inspection department and the other the final inspection department. The works inspection department checks up on all working processes before the product reaches the end of the final assembly lines. The whole of that department is responsible to me as works manager. The final inspection department is responsible for the standard of the final product, the complete job in the final assembly state, and I am afraid that I have no wish at all to take over that particular department. As a matter of fact even the works inspection department is embarrassing at times, on the one hand having to keep up the output and on the other hand keeping up the quality. But certainly as far as the final inspection department and the standard of the

final product is concerned I do feel most strongly that it should not be under the works manager.

MR. GROOMBRIDGE (Section President, who presided): Going back to that question of inspection, I would like to point out for our friend's information here that in a place controlled or partly controlled by the Air Ministry they will not recognise the chief inspector as coming under the works manager. He comes directly under the general manager. Now, as a works manager of a few years' standing, I would like to say that apart from a board meeting there should be two management meetings held in the works. One with the chair taken by the general manager attended by the works manager, chief inspector, the head designer, the service manager, and the sales manager, where problems come up for discussion. In my own point of view this is a very important meeting. From our own works we get a great deal of information from troubles that arise. We have a system working whereby we are able to get useful information from our service manager concerning little troubles which customers experience, perhaps due to flying difficulties, etc., and by investigating these, we save a considerable amount of money.

There should also be a works production meeting. The chair is taken by the works manager, and those present should be production engineer, works superintendents, or departmental foremen, production control chief, buyer, chief tool designer, chief storekeeper or stock controller and chief of progress. There you can talk over general problems of production in hand. I do not think these meetings should be run on a set agenda issued to those attending before the meeting, but on an agenda produced by the works manager built around current happenings.

I have one or two other points to mention. The first is with regard to the Home Office Regulations and Safety Act. I think it is best to employ what you might call a "Safety Man." It may not be a full-time job, but he would be a man with an independent feeling about his job. He could meet the inspectors when they came, hear their complaints and give a full report on same, and he could deal with the urgent or minor points, but anything more delicate could be reported to the works manager. I think this is very essential as it does give you an independent man in the factory who is also looking after the interests and health of the men in general.

There is also the question of heating and ventilating. In laying out a factory one should give due consideration to temperatures and ventilation, taking each department separately, as what is required for one department may not be required for another, as in some shops different air changes are required.

In connection with the question of staff overtime, I think you will agree with me that this is usually authorised by the works manager. The reason for this as a general rule is not due to produc-

tion being behind, but the works manager is often faced with the problem of either taking on extra staff or putting people on overtime, and I do not feel that a man should be penalised for having to work extra hours. There is also another point which arises, i.e., it will be found that the man in the shops will be earning considerably more money with overtime than the man on the staff, and the latter then loses interest.

Regarding the question of types, I think I am right in saying that one is forced to have a number of different types, and this is often brought about by the keenness of competition in getting new products on the market and to keep one's business going one has to keep in line or, if possible, one ahead of competitors.

Concerning the rest period, I feel that it is only necessary to have one break in the day and that in the morning, as operators often have considerable distance to travel, sometimes taking as much time as two hours in getting to work, and if a ten minutes break is given them (as is the custom in the company with which I am at present) it will be found to have a very helpful influence on production. As the afternoon is not so long, I do not think it necessary to have a break.

MR. PUCKEY : I partly disagree with Mr. Groombridge on the question of conferences. I do agree regarding the conference which links up the various departments other than production and I expressed my views on that in the paper, but at the same time I disagree with this conference without set agenda as regards the works activities. I do feel that there should be a set agenda and that every meeting should be called for a specific purpose, that the points should be known before-hand and people should not come to the discussion for the purpose of talking. The more time they have in advance to think things out and prepare their points the more valuable the discussion is going to be.

Regarding safety first measures, I still maintain that each departmental superintendent should be responsible for his own safety measures. By that I do not mean to say that he is responsible for making his own guards. All that should be under the care of the plant engineer, and also any replacements. But I do emphasise most strongly that every departmental superintendent ought also to be responsible for his own measures. Both the plant engineer and myself can take action on any dangerous or unsatisfactory features reported to us by the superintendent, but I do feel that as the man has to run his department he should see that the machines are kept in first class condition. Regarding the rest periods in the morning and afternoon, my only comment is that if ever I want to go to sleep it is in the afternoon.

MR. WASHBURN : I should like a little information from the

lecturer on how he would fix the qualifications of the members of the planning department.

MR. PUCKEY : I think before I reply to that fully I should like to have a little time to think it out and to lay down in some decent order the requirements for the planning department staff. All that I can say now is that I should imagine a man who had the ability to analyse a subject into its elements would be the most satisfactory man in this department. It needs a first-class man to analyse a problem into all its constituents, and to point out weaknesses, and I should say that that is the most important single requirement of a man in the planning department.

MR. W. G. CARR : The first point I would like to raise is that of machinery replacement. I have read both the articles which Mr. Puckey referred to and I find myself rather in agreement with a lot of the views expressed there. One of these was, I believe, that machinery should be changed every seven years. I do not definitely agree with seven years, it will of course vary with the various machine tools. But the difficulty with machinery replacement is that, while from the production side we can definitely justify the buying of new equipment, the higher administrative and management side seem to be under the impression, or cling to the idea that while we can do the job with the old machines let us do it. Well, appreciating their point of view with regard to the laying out of capital on the plant, the policy does not seem quite right to me, and although we can get through the job now, the further work done by the machines makes them in a worse condition and then we shall probably be in the position of not being able to get our machine tool replacements when we get sanction to buy. The result of this policy of not replacing our plant when it is getting out of date is to bring production to a standstill in the future while we are waiting for plant to come in. What I would like to know is if Mr. Puckey has any persuasive measures, other than, shall I say, diplomatic talk, that can be used with the management in overcoming this idea of not replacing plant when we can still carry on but inefficiently.

The next point is one which is not directly allied to production, that is, the question of sports clubs. From my own experience I do not agree with sports clubs being run in conjunction with companies. I have found that unless the company is very large and can afford to keep a sports club that caters for cricket, billiards, and a variety of sports to cover the whole of the recreations one would expect to find amongst the personnel it tends to become too localised, that is, that the sports club causes those partaking in it to automatically form themselves into a clique. Even in the last day or so I have had occasion to note that after a football match there is a tendency to wander away from work to discuss and criticise the game. This



is all very well, but production is not going on. I would like to hear what Mr. Puckey thinks regarding this question.

The third point is another which I think is not only of interest to individual firms. It is of national interest and particularly to this Institution. There is the question of the apprentice scheme. Again I think there is something similar to the sports club, and that is that with the larger company they can afford to run training schools at a reasonable expense and offer a comprehensive training system, but when considered in relation to the small company there is always the possibility that the money spent on inadequate training could be more profitably spent on production. Actually I think the advantage of the apprentice scheme to the small company is definitely on the company's side quite apart from that to the apprentices. I think that as this subject is assuming national importance and it is likely to do so more in the future, that it merits special attention from the small company's point of view.

I would like Mr. Puckey, if he can spare a few moments, to answer these few questions, after which I will ask you gentlemen to join me in a hearty vote of thanks.

MR. PUCKEY : I can only say that the discussion this evening has to a very large extent borne out what I feared when I wrote this paper. Well, to be quite frank, I think I have rather failed in my object because I have made the paper rather too comprehensive and consequently the discussion has been very wide and general, and I am rather sorry to say that it has not given me much of a solution to the various problems which I have put forward here.

This question of machinery replacements is one of the factors invariably brought up for discussion. We had a remark from Mr. Hales which was much appreciated, and I do really think that a little more discussion on this point would be profitable to us. I mentioned that the question of machinery replacements is a sticky one, and everybody apparently thought it was sticky because no one has mentioned it. As to the way of determining the life of it I mentioned periods of six months to seven years. I still do not know why people take these varying periods. Personally we use five years in my own works. Why I do not know ! Nobody knows ! I do feel, however, that the two articles in *Machinery* to-day admirably express my point of view and I would like to congratulate the people who wrote them.

I do not know any particularly persuasive measures to take with directors regarding this question of purchasing new machines. Just lately I have been successful. I have recently read an article on salesmanship ; I do not know whether this has anything to do with it or not.

I agree with Mr. Carr's remarks regarding sports clubs. I feel that only a very limited number of employees take a real interest



#### PERSONAL PROBLEMS OF MANAGEMENT

in them and it is really very doubtful whether we gain any advantage from them. If the company did as I suggested in my paper they might be better off and the greater majority of people would be more satisfied. I was very interested to hear Mr. Carr's remarks on training apprentices and to a large extent I agree with him.

MR. CARR then proposed a vote of thanks to Mr. Puckey for his lecture, and this was adopted with enthusiasm.

## Discussion, Leicester Section.

MR. W. H. BINGHAM (Section President) : I think you all agree with me that we have listened this evening to a most comprehensive paper. At the conclusion of the paper Mr. Puckey said that there were other, or many other, phases of management with which he had not dealt, but I think that he has dealt with all phases and aspects of management.

I feel like a schoolboy, or apprentice, who has been invited by his teacher, or his departmental manager, to make a tour of, shall I say, the British Industries Fair, or the Ideal Homes Exhibition, and on getting to the entrance he is given a catalogue. The teacher says : "Come on, Johnny," and we go up one gangway, down the next, and so on for a space of one and a quarter hours, and find myself outside again with the catalogue in my hand, and the teacher asking : "What do you think about it, Johnny?" It has been such a comprehensive treatment of the subject.

Mr. Puckey is hoping that there will be some discussion and if there is to be any I am relying on some of you others having had sufficient attraction at some particular point, or, shall I say, standing effect, to cause you to dwell there, and as a result of which you have some criticisms, or suggestions, to make.

The whole thing is a kaleidoscope to me. If I could be allowed to take this catalogue home for a week, I might be able to come back and put all sorts of pointed questions to Mr. Puckey. As it is I have got what is practically a blank catalogue. I have got a pencilled note on this page, and on the other, but I have got no sequence of notes at all on which to make any comment. All I can do is to make the best of the scrap of notes I have.

On the first page I have a reference to Mr. Puckey's remarks about goodwill. He stated that the grade, or quality of work, helped to build up, or affect, the goodwill of the concern, i.e., Rolls-Royce, and the high standard of quality known throughout the world and recognised as the hall-mark of perfection, but I maintain that a concern can have goodwill, equal to that of Rolls-Royce, and yet be producing a lower grade of product, because there are marks for lower grades of production as well as for higher ones. I do not entirely agree with Mr. Puckey on his estimation of the quality, or grade of work, on the value of the goodwill of a manufacturing concern.

I have another note here in connection with increases in salary contrasted with appointments of additional personnel. Mr. Puckey said it was usual, and often demanded, that increases of salary

should receive the authority, or sanction, of higher executive, whereas no criticism, or objection, was ever made to a departmental manager increasing his personnel. I can see a distinction there, and I can see the need for the authority to be obtained in one instance, and not in the other. If an additional workman is taken on at ruling rates, the management, or the higher management, have it as you will, would say—"Well, that does not matter, we are going to get extra work for the normal rate value"—whereas an increase in salary, or an increase in a weekly wage, is tantamount to paying more for the same amount of work that has been done, or is being done. One is an increase in wage bill, with an equivalent increase in production or in output, and the other is an increase on the pay roll with no increase in production, or work.

Mr. Puckey estimates that the average cost of engaging a new operator, a semi-skilled one, apart from scrap possibilities, is £11. Now, I have a scheme in the establishment of a new industry, in which I hope ultimately to have, say, a thousand employees of the semi-skilled type. I have at the commencement of my operations, a few key-men such as may be necessary to start the programme. Am I going to be faced with a loss of £11,000 before I get my production programme and my works into full swing?

With regard to overtime, and the advisability of putting an employee, who has been habitually on overtime, on to a fixed weekly rate. I have an instance to quote from my own experience during the last few weeks. I have a man in my organisation, who is the handy man of the concern. This man does all sorts of odd jobs throughout the factory. It came to my notice a week or two ago that his earnings, with his overtime, were considerably in excess of his normal weekly takings. I thought, "I cannot dispense with this man, and I cannot curtail his hours." Curiously enough, he came to me next day—what prompted him to do so, I do not know. He said: "Excuse me, may I have a few words with you about my position?" "Certainly," I said. He then said, "Well, can I be put on a flat weekly rate like the motor drivers?" I then said, "Why?" and his reply was, "I would know where I was then, there would be some satisfaction in having a fixed weekly wage." "But," I said, "you are getting considerably in excess of a fixed weekly wage." He replied, "I know that, I realise that I am asking for an Irishman's rise." As a matter of fact, he had never contemplated the cutting down of his hours. He is responsible for certain duties after the factory has been closed, with the result he puts in two hours extra every day over and above the other workers. Well, in my deal with that man I rather hesitated to quote a figure, but when I did he was highly delighted; he thought I was most generous. He is going to be paid 15s. less per week, and he is

thoroughly satisfied. It is a feeling of security and the knowledge that he is on a fixed weekly pay. Whatever a man takes per week, he bases his standard of living. To drop a man like that from abnormal hours to normal hours will be a big shock to him. That was just quoted as an instance where it is preferable to put men who are on, shall I say, variable hours, on to a flat weekly wage, assuming of course that you get the work done for it.

I have only one other remark, and that is with reference to Fig. 17—how the manager supplements his abilities. In dealing with that Mr. Puckey said that every manager should try and realise his own shortcomings, and make up his deficiencies, as you see from the diagram, by the election of a paying expert, a production expert, and a handling labour expert, also an accounting expert. I think it is far preferable that a manager, if he can realise his shortcomings, and there are very few who can, but if he does, I think it is far better that no one should know what he has in mind, and if he can paint the picture so well with an appeal that he has to be relieved of some of his duties, and he delegates these, and in preference to making up his own deficiency, I think it is much better for the manager.

I have one more note. Throughout the whole of the paper until we come to the last page, I was under the impression that Mr. Puckey was dealing with the management as applied to the works; that is works management, but under Fig. 18 he says there what the manager can do about emergencies, in his grouping there—administration, trade, and finance. That trade and finance grouping is the only instance in the whole of the paper, I think, where Mr. Puckey has gone outside the scope of works management.

**MR. W. PUCKEY:** I do not really know whether Mr. Bingham's opening remark can be taken as praise or condemnation, but I might say when I made out this paper, and read the thing over afterwards, I did come to the conclusion that I thought it was much too comprehensive, too comprehensive in the sense that I had taken too many aspects of management, and not comprehensive enough because I could not spend the time on discussion to the questions which should be discussed, but that is as it may be. When I was invited to give the paper I had got to face those problems that I was personally acquainted with, and within my own scope, and frankly, if I made it any less I should leave out some things that I thought may be interesting. If I made it any longer I should simply be speaking to a whole group of sleeping people. I think you will have to take the thing more on those lines.

I did, however, prepare these diagrams, thinking that same may interest, perhaps very prominently interest, any individual who is interested in this subject, and you can of course take them away with you and sort them over yourself, and if anyone can get any satis-

faction, or any sense out of them, I should be glad, as my purpose has been served. I personally had no viewpoint in mind when I got down to this, although I found it very useful in helping to form my ideas, and to get them down on to paper which is, after all, the best way to have a thing. How many realise how little they know when they try to get the thing down on paper, and by putting it down in this form what I did not say in the paper, I could at least say in these diagrams.

Mr. Bingham mentioned the question of goodwill. I am glad he was so interested in thinking about goodwill, but I do not think he heard what I explained in connection with goodwill, and I repeat the particular sentence: "It is important to bear in mind that such a standing as that supplied by Rolls-Royce is not always necessary, etc., etc." I do not think he heard that.

In regard to the question of salaries, and that while the manager can take on, we will say as an example, the tool maker or inspector, he cannot take on, or give an obligation to a staff member—that is without an authority from a higher manager. There again I must disagree with your president. He tells you that directors know that when a workman has been taken on, they are getting full value for money, but when you get a staff man being taken on, there is not that guarantee that you will get that value for money, and the managing director would like to give his O.K. before that man is taken on.

Now, for example, can anyone say that an inspector is going to be of more value, or direct value, to the organisation, than, we will say, a draughtsman, a jig and tool draughtsman? It seems to me that one can get just as much value out of a draughtsman as one can from an inspector. I still say that if I take on a factory worker, there is no more guarantee of results than if I can take on an office worker.

In regard to the question of labour turnover. I found that argument forwarded by Mr. Bingham rather an awkward one to answer. I am afraid that is not quite the view point to take. I am not inferring, of course, that one would be faced with a loss of £11,000. In that particular case I do say that, in my own organisation, it costs the company £11 to take a new man on, £11 including the loss of output we get, due to the man having to be trained up to the particular accuracy we require, the average amount of scrap that man takes in working up on to that accuracy, and taking into account the amount of time allotted to that man by a departmental head. If a man has to occupy himself in training a lot of new men, he is not doing his ordinary departmental activities justice, that is full justice. I have taken records in a number of cases and it does give me the average of £11 for every new worker taken on. I

definitely maintain that high labour turnover is a direct indication of insufficiency in a firm, and should be avoided wherever possible.

Referring to his last subject of delegating authority and of supplementing one's own abilities or a lot of them. I did not, I hope, convey the impression that the manager should tell everybody that he knew nothing at all about handling labour; consequently, he was in the market for a man to handle labour satisfactorily, and that he knew nothing at all about costing, therefore, that he would like to advertise and get a man as a good supplement. The manager should get to know himself; he should analyse himself, but he will be very careful to tell no one else what he thought about. You get a surprise when you analyse your own abilities. When you do analyse, keep a little secret file on the business, and then look round for somebody who can supplement what, in your opinion, are your own weaknesses. You can delegate whatever you like and if you are a wise man you would probably delegate the costing problems to someone who knows a fair amount about costing work. You do not tell him you don't know anything about it, but you do at least have the man there.

**MR. J. H. BINGHAM:** Referring again to this question of labour turnover. I was agreed, to a great extent, with Mr. Puckey—if this semi-skilled, this new, operator, is a substitution, or replacement, for one who has left, and not additional in this replacement, I also would like that word "loss" changed to "less." The firm would make £11 less over the period required for that new operator to become efficient. Perhaps it is a distinction with a difference, but if that is not accepted, I think on the broad scheme that my arithmetic still stands.

**MR. J. MADDOCK:** I would like to ask Mr. Puckey one or two questions. He seems to have omitted completely from this paper the question of manager's personality. I, myself, consider that this is a great point. My experience has been with one man who was full of system, but he had not the personality to apply it. I know another man who also had a good knowledge of system and he had the personality to apply it, and he became a great success. The first man did not. Could Mr. Puckey give us any information, or anything that we might work on, to cultivate that necessary personality to become a successful manager?

Regarding the question of wages incentive for staff workers. We have had an expression of opinion from Mr. Bingham also on that. I should rather think that the man who asks to go on the staff on a 15s. reduction in wages is looking a little further than Mr. Bingham has seen. He is looking forward to the fact of four holidays a year. He probably expects a fortnight's holiday a year with pay, and he will probably be allowed a month's illness without any reduction in pay, and I think, Mr. Bingham, you would eventually lose this 15s.

Further, has he any experience that the illness of staff workers is psychological? My experience is that in a department of seventeen workers, I find myself occasionally with five workers off together. This has not happened once, it has happened many times where there has been as many as five out of seventeen workers off at the same time—someone has got a bad cold. I do not say that it is intentionally done, but it does seem to be the case.

Secondly, have you any experience in this apparent wage incentive for staff workers? It seems to be a problem, and it has occurred to me that some kind of wage incentive might be introduced, based on the profits of the company, and yet I have never heard anything of any such incentive being started. Can Mr. Puckey tell me the reason why?

MR. W. PUCKEY: The subject of personality is a very difficult one indeed to answer. If I had to define personality, I should have extreme difficulty in doing so. There are people who can go along, they are well meaning type, they seem to be good company in every sphere you find them. Some people would say that such a man has personality. Some women are better dressed than others and some of their fellows would say that particular woman has personality. Frankly, I do not know what personality is. I do find it extremely difficult to analyse this thing out. I will say this, however, a man who gets up by ordinary normal methods of getting up in the world to get into a higher position must have, to a certain extent, an amount of personality. We all know of cases where some men have got into jobs that are pretty good jobs by various backstairs methods, some men who have got there by influence, some men who have got there by absolutely sheer luck, but, at the same time, we know the man who has got to a certain position in life by the ordinary normal methods of hard work and application to his job, and got his opinions respected by those below him and those above him, has, to a certain extent, got personality. Frankly, I know of no way of training a man in that direction other than the possibility of bringing out certain backward features. There are some who are not anxious to push themselves forward to the front; they are pretty good on paper but when it comes to expressing themselves to say a few words their outlook on things change, and they become much more confident than they were. I, myself, was of a shy and retiring nature, and had to force myself to do anything like this, simply because I found it was good for myself to do anything like this, where there is some way of training, or bringing out personality.

I really cannot answer this "personality," and all I can say in reply to it is that I think a man, to get a real senior position, must have some personality of that sort. Degree of personality depends entirely on the degree of success of the manager. Some managers



get to the position of manager and they stop at it, and others go a stage further and eventually find themselves in the managing director's chair, and it depends on the individual. I am afraid I cannot say much more about this. However difficult it is to explain, I feel it is rather important for a man to have an ability to mix well with people, and to give out praise as well as the blame, and a number of factors like that are of great importance. For instance, I have a discussion with various people about private affairs and things of that nature, because I feel it is my duty to do it, and there are very many things that a manager has to do when he gets in a manager's chair that are not directly connected with his business. Private affairs come into the limelight because people do rely on his ability to use the influence or advice, no one ever offers to do. If he does not do it he will find their view point of him steadily drops.

Referring to the question of illness of staff workers. I have not had that experience myself. I do know of one thing, in my opinion, that might cause that. I do not say that it does in the particular case mentioned. Very often office workers are subject to very much worse conditions than factory conditions. You very often find them in rooms which are very badly lit, and badly ventilated, which often makes these people in a bad state of health. You may find in a fairly small office, large ones sometimes, one person gets pneumonia, and due to the foul conditions, and the air in the room, the close proximity of one man to another, you get things spreading round the office and a sort of epidemic. I suggest that may be one of the causes for your experiences.

On the subject of wage incentive to, say, indirect workers. I have often heard discussed various views and opinions of the scheme you mention, whereby the profits of the company are taken as a basis for staff bonuses, except in the case of, say, the works manager, or his assistant. I do not think very much of the idea, for this reason—that the further down the scale you get towards the unskilled workers, the more those people expect their Saturday penny when they earn it. Like a small boy—you send him on a message, you promise him 3d.—if you do not give that small boy his 3d. when he earns it at first, it is not going to be any good to him about a month later, or something like that. It must be given to him on the spot for him to get the full advantage. For him to be equally keen on running you an errand, he must have his 1d. when he earns it. The same thing applies on a somewhat modified scale all the way through and the higher organisation they get, the longer they will wait and further ahead they will look to get their ultimate profits. The ordinary rank and file, however, should get their reward fairly directly at the time and, on that basis, company profits are not got out every week, they are only got out over periods



of three or six months. They know pretty well where they stand for profits, in a number of instances, in that six months, and to expect the ordinary rank and file to wait six months before that profit comes along is utterly useless to them as far as the incentive is concerned. I think the incentive should be given to all ordinary rank and file workers once a week. If you could not do that, you could give it monthly, and possibly you could go to three months in the case of managers, but perhaps you could possibly wait longer in the case of those. I contend that the profit sharing scheme is a washout.

MR. HALLAM : I have listened with great interest to Mr. Puckey, a lot of it I agree with, some of it I do not agree with, and I maintain that every business, whatever they make, have got to work out their own salvation, under the conditions they are manufacturing in the ordinary way ; it has got to be proved. Referring to the particular instance of welfare aspect and of social work—I entirely disagree with you. I have been associated with one at our own works for thirty years. I have seen it grow up to 2,000 members. The directors contribute to-day, and it used to be self-supporting, but lately it could not be so self-supporting, and somewhere round-about £500 is contributed per annum, and it is the best organisation for getting their help we have had. From that aspect, and from my point of view, it is one of the best things we have done. If you would like to visit my works some time I would show you something that would make you change your mind. We could show you an institute with all sorts of games, etc., apart from outdoor work of a social character.

I am sure we have had a very interesting paper, and I am sure it has been very good of Mr. Puckey to come down and give it to us, and I should like you to show your appreciation of the paper he has given, and another time if he has got on to something else, we hope that he will give us a further call and tell us something more about it.

This £11 loss per man rather sticks with me, for the simple reason that during the war—before the time you were manager I should say, we got men making parts of fuses. They started taking the men away before we put women on, and we had women making two for every one every twenty-four hours on machines, not only on fuses, but on innumerable parts, which meant within a very short we had not lost £11 on them, we were producing two for every one. There are one or two little points about that £11. Were you putting on a labourer, and endeavouring to make it into a skilled man job ?

MR. PUCKEY : On the subject of sports and social clubs, I am sorry but I still hold the view that I mentioned in my paper. I have had my experiences of sports and social clubs in various factories I have been in. I have been the chairman on two occasions

in sports and social clubs, and I have always taken a fairly active interest in them. I have played for various kinds of sports, and I turn up the sporting news and read them fairly often. I am quite interested on that side of the business. I still say, in the average factory, the number of people in proportion to the total number of employees, who take an active interest in the sports and social clubs, is very small indeed, but I will go as far and say that it depends entirely on the locality of the factory. Now there are some factories in small towns—I am not classing Leicester as a small town by any means—particularly in the small towns where there are very few outside activities, where most of the people live fairly close to the job, they can make a real success of the sports clubs. Very few people do really take part in the clubs. In the London district the tendency is to get further afield from London. The tendency is for workers to travel further to get to their jobs, and there are cases of people coming a few miles every day to get to work. In my own firm we provide first class facilities but the number of people who take advantage of them is very small indeed. Social functions are organised by the directors at a very nominal charge. These 3d. functions for the employees are held, and they are very successful indeed. They are special functions organised by the directors, and they are practically held at their expense. Those things are very very popular, but the social and sports club—a rate of one out of every 100 persons take any interest at all. I will say with you that it depends upon the district in which you live and the locality of the factory. Maybe in some places it works alright but, in my experience, I have not found it to be quite as you make it out.

This particular figure of £11 is taken in training the labourer up to a skilled job, but taking it on an average with female and male labour it is about half and half getting these people in. They have some sort of knowledge of assembling machine work and you get them into the factory and you train them up to your way of thinking, to your standards and your accuracy, and fitting in with your organisation, and the total cost—it has been very accurately worked out and I can assure you there are no bones about it, it is an accurate figure, it has been worked out at £11 before that operator, who has some prior knowledge of assembling, maybe can use a screwdriver, and has a certain knowledge of the job, but not the special knowledge that we require, is at par with ordinary normal operators in the shop working on a similar job. It is not made up of direct work on the part of the operator but by various preparations of the people who require to be engaged, the stationery required, the taking of references, and a dozen and one different things that come along, the loss of material, and of parts scrapped—due to the operator not having that special knowledge we require—loss of the standard

#### PERSONAL PROBLEMS OF MANAGEMENT

bonus that they would expect to earn in the factory, altogether a total cost of £11 per employee. This does not in any way cut across girls in making fuses. I was apprenticed during the war and I happened to be a setter-up on fuses. I found them very efficient on the job. I am taking an average through the factory and taking that average all the way through, the figure comes to £11, which I still say is an absolutely accurate figure as far as my own factory is concerned.

## Discussion, Southern Section.

MR. GAUNT : What was your meaning about " market plus rate ? Do you mean more than district rate ?

MR. PUCKEY : The market rate is the standard rate applying to district rate. Plus means a little more added on to it.

MR. GAUNT : What about the case of federated firms ?

MR. PUCKEY : Federated firms usually specify limiting rates of pay. There are, however, ways and means of paying more than the standard laid down ; for example, certain " key " men have often been put on to the staff at a higher salary.

MR. WESTBROOK : I see one thing in the paper under the heading " How to ensure correct lighting." You mention " locking rings on bulbs." Is that a special scheme ?

MR. PUCKEY : It is quite a standard fitment. There are two or three types in use. In general it is quite a simple ring that goes on before the bulb and prevents people taking the bulb out without a key. We have found that it has prevented them taking the bulbs out and taking them home. They can be purchased from any electrical firm.

MR. WESTBROOK : Could you tell me what your employees do during the two ten-minute breaks ?

MR. PUCKEY : Certain employees go to the canteen where they are at liberty to smoke and talk, and others sit at their bench, while in suitable weather certain floors walk round the factory grounds.

MR. FORGE : In you chart No. 4a, I am interested to know where you place the design drawing office ?

MR. PUCKEY : The design drawing office should be responsible direct to the managing director. In my opinion, design is a special function, and as a department should not be responsible to the works manager.

MR. FORGE : The source of a large number of works problems is that the drawing office is not sufficiently close to the production section ?

MR. PUCKEY : I do not think he should be responsible in any way for the designs the company makes. There should be some set-up in the system, which should provide discussion on drawings in their tentative state and before they are put into the finished drawing form.

MR. FORGE : Another interesting point in favour of having a very clear organisation chart. In the case of a works, employing

1,500 people with the works manager and various production people and so on, it is rather tedious progress when the works manager wants to pass correspondence down to a certain man ; this has to pass through different stages to get to the man concerned. I am also interested to hear your championship of the direct piece-work system. Is it not better and easier than the premium system ?

MR. PUCKEY : I said piece-work on the time basis. My idea on the matter is that the man should have a guaranteed weekly wage, and whatever bonus he earns is on top of that. Where a time is set on a job—say five minutes—if he does it in three minutes, then he gets the equivalent of the time saved. That is what I call direct piece-work on the time basis. I do not agree with taking it away from the man and putting it into the firm's pocket. My idea is that the workman has all savings put into his own pay-pocket. My organisation chart shows a planning supervisor over the various planning departments and a works supervisor over the doing departments. I can then go round with the individual who is responsible for each section and we can discuss the matter concerning this or that department and get right down to the trouble on the spot. If I had no men to do that, I should have to go round to each department myself, whereas with those two men, they can collaborate and present two sides of the position instead of about fifteen.

MR. WESTBROOK : Do we understand you are adverse to the premium bonus system ?

MR. PUCKEY : That depends on what you call " premium bonus." My idea coincides with what I mentioned a little while ago and that is a set time should be allowed for the job. If the man can do it in less time, then he gets all savings on that job. You get the best possible time study men you can and let them analyse the job and you should stand by what time they estimate on the job. I believe in the end it is a better method of dealing with incentives.

MR. WESTBROOK : Is it right of the Detroit people to limit the number of employees ?

MR. PUCKEY : My own view coincides to a great extent with theirs. The condition of skilled workmen employed in the engineering industry has of recent years not been particularly good, the rates being in general very low. There is a tendency when trade revives to take on a large number of apprentices and for the trade in general to become more attractive, and when a slump does come along it is found that the demand is very much less than the supply, consequently the standard drops. Surely it would be better to limit the number of apprentices to give a reasonable guarantee of continuity of employment afterwards ? Many firms, as soon as their apprentices

finish their time, pitch them out—a policy which has been adversely criticised by many.

I feel that if one took more care in taking on apprentices one should endeavour to keep these young fellows as long as possible, and while I personally think that it does no harm to an apprentice to get added experience elsewhere, I should prefer the onus of leaving to be on him and not on the company.

MR. WESTBROOK : There are two points I am interested in. One is, I saw a comment that in America the labour shortage of men is more acute than it is here ; and the other is that for some time they have been employing as many skilled men as they can get here ?

MR. PUCKEY : I am referring at the moment not to the skilled men of to-day in particular, but to the skilled men to come. We know that to-day we have a shortage, but that does not necessarily mean that we shall have one in five or ten years' time. I think now is the time to make some attempt at controlling the position of the future.

MR. FARROW : Could we have your opinion on allowing smoking during the normal working hours ?

MR. PUCKEY : I find it difficult to give an opinion as I am a non-smoker. Trying to be unbiased, I am more in favour of allowing it, than I am of prohibiting it. I will say, all things being considered, smoking all day wins.

MR. TOWNROE : I suggest that one of the difficulties of works management is not so much to get men to work, as to get men to work together ?

MR. PUCKEY : I mentioned that as far as the department outside of those under the works manager's control are concerned, there should be a conference to sort out the various problems. I do think in that case there is an advantage of having conferences. Regarding conferences for the works manager and department heads, I am not particularly keen on having regular ones. I prefer, in general, to have a specified subject for discussion.

## SOLUBLE AND CUTTING OILS.

*Discussion, Glasgow Section, on paper presented by  
C. B. Wingfield.*

*(Mr. Wingfield's paper was published in the January,  
1936, issue of The Journal, Vol. XV, No. 1.)*

**M**R. J. WRIGHT: I personally thank Mr. Wingfield for the excellent lecture and should like to raise the question of the "loading" of the soluble oil, no remedy for that having been mentioned. Would the lecturer recommend any form of filter for the purpose?

MR. WINGFIELD: I presume you refer to dirty oil.

MR. WRIGHT: Not exactly. I had in mind the loading of the lubricant by fine particles of metal or abrasive, practically powder.

MR. WINGFIELD: The best method is to use a separator. Soluble oil seeds are so cheap, however, that it does not pay to clean them.

MR. WRIGHT: The cost of the oil is certainly low, but what I have in mind is its continuous filtration in order to prevent minute solid particles reaching the cutting point from the sump. Soluble oil is used as a grinding lubricant and wheel makers claim that it is highly desirable that *any* loose solid matter in the lubricant should not be pumped over the work because of its deleterious effect upon the quality of the surface being ground. Again, in the case of automatic screw machines. When the work involves deep, narrow cuts, these fine particles, almost invisible, even under a lens, are trapped between the blade of the tool and the work, especially when circular form tools without side clearance are used. In such circumstances the face already turned is torn. These features are definitely recognised in connection with up-to-date lubrication practice as being most objectionable and filtering is recommended. I hoped Mr. Wingfield would be able to throw some light on the question of a cheap and adequate means of removing this metallic sludge almost as quickly as it is formed. Centrifugal separators of the DeLaval or Sharples type are often ruled out on the score of cost.

MR. WINGFIELD: Most of the independent feed machines have a very fine gauze strainer over the intake of the circulating pump, which appears to be quite an efficient means of separating the metal swarf from the cutting medium. With the central systems there is usually a strainer or separator at the settling tank end, which is very effective in cleaning suds and cutting media. As to recommending any particular form of filter, I think these are all more or

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November 21, 1935.

less satisfactory since to separate metallic particles from a fluid such as soluble oil suds or thin cutting oil is not a difficult proposition.

MR. CAMENZID : I would like to ask how long the efficiency of the soluble oil is likely to last.

MR. WINGFIELD : Oils under normal conditions will maintain their lubricating value for considerable periods, but cutting media like internal combustion engine oils, soon become unservicable owing to serious contamination with foreign substances. Metals are often delivered in a scaly or rusty condition and some even bear the remains of pickling acids, consequently the life of soluble oil suds becomes shorter in these cases than if one is working with bright and clean metal ; therefore I cannot give you any definite guide. Under clean working conditions soluble oil will last many weeks, although in some of the larger factories it is considered best to play for safety and change the suds once a fortnight or even once a week.

MR. WEBSTER : Would you recommend the use of a light soluble oil against a soapy water solution for grinding ?

MR. WINGFIELD : The best grinding medium is ordinary water, because grinding calls for a coolant and needs no particular lubrication. Water is seldom used nowadays, however, on account of its rusting propensities, but quite a number of shops add a small quantity of soda crystals. Whilst this offers some safeguard it does not entirely cut out the trouble. I suggest that a weak dilution of soluble oil, more so of the new transparent type, is much more efficient than a soap solution since the latter is apt to leave behind a sticky film after the water has evaporated.

MR. G. M. BUCHANAN : Engineers, as a rule, take a lot for granted and rely on specialities for the supply of many of their materials such as soluble oil. It would be of interest if Mr. Wingfield would describe to us the ingredients of a good soluble oil, pointing out the advantages of each component. The "straight" oils are known but soluble oils are usually said to contain some mysterious ingredients which are guaranteed to remove all lubricating difficulties. Mr. Wingfield, being a chemist, might be inclined to tell us what are the best properties to look for in the theoretically perfect cutting compound.

MR. WINGFIELD : Soluble oils are usually made up of two main constituents, a mineral oil (which is generally a petroleum product) and a vegetable or other type of fatty oil ; since neither of these two products will make a stable emulsion when diluted with water, a third constituent known as the emulsifier or soap must be introduced. This is done by adding a small quantity of alkali, either caustic potash, caustic soda or, in rare cases, ammonia, which combines with a small percentage of the fatty material and produces a water-soluble soap or emulsifying agent, in the same manner in which



ordinary household soap is produced. Lime is not used in this instance because the resulting soaps would not be water-soluble.

When one considers the various types of fatty oil and the quality of each, also the variation in quality of mineral lubricants, it is quite easy to foresee that the resulting products will differ considerably. For example a soap or emulsion made with a fish oil as the base will not give a product equal in quality or efficiency from the cutting aspect to one made with lard or rape oil.

To this soap and fatty oil mixture a percentage of mineral lubricating oil is added, and here again much depends on the quality and the amount of oil that is added. One can quite see that a soluble oil made, for example, with equal parts of fatty material and mineral oil will give a richer and more stable dilution when mixed with water than will one which contains, say, 80% of mineral oil and 20% of fatty oil.

MR. BUCHANAN : Some soluble oils have better capacity for conducting heat than others ?

MR. WINGFIELD : I would not say that of soluble oil, because for the disposition of heat you rely upon the water rather than the oil. The bulk of soluble oil dilutions used to-day are in the neighbourhood of 20 : 1, therefore it will be noted that 5% of oil in water cannot play a very important part from a cooling point of view. But, mark you, I agree that the 5% of oil does become an important factor from the lubrication standpoint.

MR. J. W. MALLETT : I would like to ask a question about the effect of cutting oils on floors, and, first of all, on wood floors. When using cutting oils very often a good deal of oil is spilled around the machine and the floor becomes slippery and dangerous for traffic ; also the cleaning of floors becomes a problem. What would Mr. Wingfield suggest as the best way of cleaning oil off wooden floors ? Then there is the question of attack on concrete, say on the concrete floor of a ferro-concrete building. You have the concrete surface of the floor itself and the steel inside. The building itself has possibly not been erected with the greatest care and there may be porous portions through which cutting oils, either straight or soluble, may penetrate to the steel. Is there any acidity in a cutting oil which may make it dangerous in such circumstances ? Do either of the oils mentioned have a bad effect upon concrete in which there are interstices which may be penetrated.

Then there are the same factors where magnesite floors are laid. We had a case where soluble oils had such an effect as to make re-flooring necessary. Would a modern soluble oil have the same effect ? Then, as to sulphur in oil ; in the old days we used to throw loose sulphur into the oil and get a good job. What is Mr. Wingfield's opinion, was it really a delusion or did we get a better job ? Sulphurised oils are used in cases where machineability is

poor. Can a *temporary* improvement be made by the addition of sulphur itself? If so, what is a reasonable amount per gallon of oil—such an addition is generally made by guesswork.

On automatic machines, most people still use a mineral oil because of the need for lubrication of the working parts of the machine; some people use a soluble oil. From your own experience would you say it is safe to use a soluble oil on autos engaged on accurate work to fine limits?

Then as to dermatitis. I have known cases where a tank of soluble oil has smelled badly. The operator concerned has been personally clean but has been in the habit of throwing apple cores into the tank. Is there anything to neutralise the effect of vegetable matter or tobacco juice upon soluble oil?

MR. WINGFIELD: As to the wooden floors, this becomes one of those problems, that if oil gets there, well, there it is! One large motor manufacturer, Messrs. Ford, of Dagenham, employ quite a small army of men whose job is solely to go round the factory, covering several acres, at least three times a day and keep the wooden block floor as free as possible from oil and grease. These men are armed with a long mop and a bucket of strong soda water. The condition of the floor, after three or four years of use day and night is remarkable.

Apart from this continual attention one can only suggest an occasional treatment with some solvent such as benzene, white spirit, or a non-inflammable product like trichlorethylene. This treatment will ensure that the surface is at least free from oil. It is of interest to note in passing that there are quite a number of oil firms marketing an oil for dressing wooden floors, also concrete, for the purpose of allaying dust.

As to the second question, regarding the effect of oil on concrete, it is said that in time the structure is more or less affected. Certain experiments have been carried out by introducing oil in the cement mixture in order to render the finished concrete waterproof. Whilst such experiments have been successful from this point of view, it has been found that the actual breaking strength of the concrete is far below standard. One can only assume, therefore, that oil must have some bearing on the life of the concrete.

As regards the action of acidity from oil on iron, there are no corrosive acids in the well-known grades of cutting oil. One does, however, have to take care of the fatty acids which originate from use of pure fatty oils like lard, rape, etc. Such oils are apt to become rancid with age, and the acids produce a type of verdigris or pitting action, more so on non-ferrous metal.

Oil will affect a composite floor. Most of these floors are porous, so that the oil percolates through the surface and is absorbed by the composition, which often consists of asbestos fibre, wood fibre,

and other such material, with the result that there is a bulging effect and numerous cracks appear. Soluble oil suds are likely to have the same effect.

Regarding the result of adding sulphur to cutting lubricants, we would state definitely that there is advantage to be gained.

Sulphur and graphite are considered the two best solid lubricants, sulphur more for its cooling properties than for its lubricating value. The longer the tool is kept reasonably cool, the longer its life and the better the cut which results. To add flowers of sulphur by just throwing in a handful, one is relying entirely upon the agitation of the oil to keep the sulphur in suspension, and as soon as the machine is at rest it will be found that the sulphur will readily settle to the bottom.

Research work has been to chemically incorporate the sulphur ; that is, to actually dissolve it into the oil or oils so that there is no possibility of separation.

To incorporate with the fatty oil appears to be the most successful procedure, since a much larger percentage can be introduced. There is no doubt that the introduction of sulphur to cutting medium has been a great stride in machine shop operation. Further, it has been a great asset in the lubrication of extreme pressure gears.

As to the use of neat oil on automatics in preference to soluble oil, this depends mainly on the class of work in operation, also quite a lot on the machine shop superintendent's ideas. I have seen Gridley four spindle automatics working on soluble oil, also the same machines on neat oil, with little to choose between results. Quite a large number of very high speed automatics at the works of a leading gramophone company are running on soluble oil with perfectly satisfactory results, whereas a well-known tyre company, doing a less exacting job, find it necessary to purchase expensive neat cutting oil.

As previously mentioned, soluble oils, if they can be adopted, have proved to be just as efficient if not more so than neat oils, their only disadvantage being that they are apt to cause rust troubles if neglected.

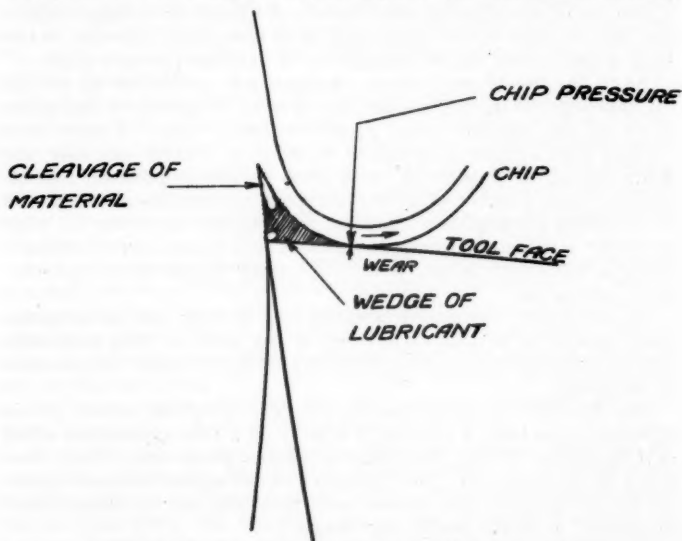
MR. FRASER : I would like to ask Mr. Wingfield which, in his opinion, is the best, a mineral or a fatty oil ? Our experience, when cutting copper, is that the compound turns green with a fatty, but not with a mineral oil. The change of colour makes the men apprehensive of possible skin disease and they also say it affects their stomachs. Is there really any danger ?

MR. WINGFIELD : Of the neat cutting oils I would suggest a mineral oil for use on non-ferrous metals, since fatty oils have a tendency to set up a verdigris action owing to the fatty acids present in the oil. One can estimate that 99% of brass and cutting operations can be dealt with by a straight mineral oil. Soluble oil suds can be

used but great care should be taken that a neutral oil is used, otherwise the suds will soon assume a somewhat treacherous looking green colour as mentioned by Mr. Fraser. As to the danger, so far there has been no cause to suspect such, since there are numerous shops working under such conditions and having no trouble from dermatitis.

MR. BARNES : With reference to lubrication, in using that term, are we talking about the lubrication of the machine or the tool and the job ?

MR. WINGFIELD : I am glad you raised that question. We are actually referring to the rubbing action or pressure on the tool created by the swarf turning or cutting during operation. As previously mentioned, the bulk of the heat generated is not due so much to the tool rubbing on the metal part actually being machined, but to the continual rubbing action or pressure on the top face of tool. One can imagine the edge of the tool ploughing its way beneath the skin or surface of the metal, but the partially severed material is continually pressing down on to the tool until it reaches



SKETCH IN EXPLANATION OF Mr. McFARLANE'S POINT.

Movement of chip creates a continuous feed of lubricant to the wedge. Lubricant is thus carried as far under chip and as near point of pressure as the smoothness of tool and the magnitude of pressure will permit. Wear nevertheless does take place at the area over which the chip bears. The smoother the initial face of the tool, the longer the machining time ere breakdown of tool face occurs.

the breaking point. It is said that most of the tool wear is taken across the top, hence the suggestion that an adequate film of lubricant should be applied between these rubbing surfaces, not only to lessen the amount of friction but to assist in dissipating the heat.

MR. J. MCFARLANE: Is it not the case that the action here is pretty much the same as in the Michell bearing, i.e., the lubricant gets between the tip of the tool and the point where the chip bears on the tool, so that a wedge of oil is formed and carried in, along with the chip as it presses over the tool face?

MR. WINGFIELD: Yes, I agree that the lubricant should get in between the top of the tool and the surface where the chip bears on the tool. As I replied to the previous question, it is essential to get the cutting medium as near as possible down to the tool edge.

MR. CAMENZID: Can Mr. Wingfield say anything regarding the lubricating of aluminium during cutting?

MR. WINGFIELD: Aluminium is a metal in its own class, and the bulk of that cutting does not require a lubricant. The main object there is to keep the tool cool, and I think it is quite true to say that the best thing for cutting aluminium is paraffin, although in some cases soluble oil has been found to do the same work. The addition of a small percentage of sperm oil to paraffin will greatly improve the finish of the work and also the tool life.

MR. CAMENZID: Using a weak solution of soluble oil, can you tell me any method of preventing chips?

MR. WINGFIELD: One of the essential features of a cutting medium is to have a good scouring or washing effect. The density of the medium has a lot to do with this action; for example the density of paraffin is only about 0.810 compared with water of 1.000 therefore the swish or flow of water would have greater sweeping effect on the steel or iron swarf than would paraffin. Since the density of aluminium is much below that of iron, hence paraffin will serve quite well as a scourer in this case.

MR. CAMENZID: But sometimes one finds that chips fuse of the tool and it is impossible to get them off.

MR. WINGFIELD: Do you mean when using soluble oil you get fusing?

MR. CAMENZID: Yes. You get a fusing on the end of the tool.

MR. WINGFIELD: This is probably due more to the speed of cutting than the actual cutting medium, but personally I have not met a case of this description.

MR. S. M. HARDAKER (Chairman): We have taxed Mr. Wingfield fairly well. Fatty acid has been referred to. In the field of ordinary lubrication I have seen instances where the addition of a small

percentage of fatty acid has considerably improved the lubricating properties. With regard to specifications; my chief difficulty is to obtain any definite specification. Is it possible to draft a specification so that it will ensure a particular oil being perfectly satisfactory for a given purpose? In my own opinion, this can only be partially achieved by specifying a number of "Special Tests" and correcting the results of one against another. Mr. Wingfield referred to a supposed exudation from a person suffering from rheumatism having an effect on steel. I myself have known a person leave a green film on the seat of a chair. It would be interesting to know the reason for such an effect.

MR. WINGFIELD: As to the question of fatty acids, it has been definitely proved that the addition of 1% of free fatty acid to a lubricating oil adds to the surface tension and gives a little better travelling speed. As to the other question about the green film, I am afraid I cannot throw any light upon that, but I do not think that it is parallel with the illustration I gave of a rheumatic skin.

THE CHAIRMAN: We have listened to a very interesting paper and discussion. Mr. Wingfield has been very lucid in explanations and I am sure it is your wish that we should accord him a very hearty vote of thanks. (Applause).

## TIME AND MOTION STUDY.

*Discussion, Edinburgh Section, on paper presented by  
by L. Clayton, M.I.P.E.*

*(Mr. Clayton's paper was published in The Journal,  
Vol. XI, page 371.)*

**M**R. J. L. BENNET (Section President): When I introduced Mr. Clayton, I suggested that he might treat his subject from an academic point of view or from a practical one. There is no doubt about which line he has taken. He has shown a grasp of his subject which has been interesting, and I am sure, illuminating to many of us. Dealing with Mr. Clayton's remarks on motion study, I wonder if he has ever had any contact with studying female operatives on power presses? The instance of accidents, I think, in a factory where power presses are used is largely amongst the power press departments, and motion study to my mind might quite easily, even at a certain cost, preserve in time a limb or a finger, if such practical observations could be carried out. I would like Mr. Clayton to let us know if he has had any experience of this line of motion study.

**MR. CLAYTON:** I have never applied motion study to the operators of power presses. As Mr. Bennet suggests, accidents are apt to be frequent in the press shop and, where accidents are possible, motion study should be used with caution because, when the operators have become very familiar with the motions, and they are performed almost unconsciously, they are liable to place their limbs in a position where, owing to some unusual occurrence, they may be harmed. In cases where motion study has been applied to operations with a very short cycle time—say from a fraction of a second, as in the case of the operation of hand fed printing press, to a maximum of about five seconds as in the manufacture of hand-made cigarettes or the winding of small coils or armatures for fractional horse-power motors—the continuance of these motions for long periods of time produces in the operator a curious state of mind in which he continues to go through some of the motions of his job even when not actually producing. The making of cigarettes by hand involves some very odd motions of arms and shoulders and I have seen girls engaged on this class of work become afflicted with a species of vertigo and they are hardly responsible for the actions or motions of which they make use in the course of their job. You will

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February 18, 1936.



readily see that this "automaticity" may be a source of accidents where power operated plant of certain types is used.

MR. A. PEET : I should have liked Mr. Clayton to have told us a little bit more on the motion study than the time, because it is one that is not used quite so much and it would have been very interesting to have had a few more examples of the motion study. I know from what he said in the lecture that he does not believe in a demonstrator, and I am quite in agreement, because I think the demonstrator mucks the whole thing up when he has finished. If a man has done his job, then I think he just puts the tin lid on. I think it lowers the prestige by having a demonstrator. I have had several years' experience with both unskilled and skilled labour but I would like to hear Mr. Clayton's opinion as to which he has had the greatest difficulty with in being able to lead them to the time study—the unskilled, or the fully skilled ?

MR. CLAYTON : My experience is that one has the most difficulty whilst using time study in connection with skilled labour. This, I think, is readily understandable because it is not easy for a tradesman to place himself in the hands of another in regard to matters over which he has always been sole arbiter. The most amenable to both time and motion study are female workers who, in most cases, will do precisely as desired. In all time study work the incentive is a very important factor ; if it is sufficient to evoke a worker's best effort one can usually manage to avoid friction. In my view it is quite unnecessary to have trouble with any kind of labour when using time study or installing improved methods of management or manufacture. One cannot get something for nothing, and using the term in its relative sense, I would say that tradesmen are more difficult to work with than so called unskilled labour.

MR. CUNNINGHAM : Mr. Clayton mentioned that the twenty year old boy should have nine minutes' rests in the day. Is there any difficulty in getting the operatives to accept this time of rest ?

MR. CLAYTON : As a matter of fact, whether one wishes it or not, nine minutes out of every hour are always unproductive ; this is the minimum and the amount is often greater. In cases when it is desired that a rest period be observed hourly it is usually necessary to shut off the power and make it impossible for work to be carried on during that period. Usually however, it is wise to avoid any red tape of this kind and, whenever possible, to leave the question of the rest period to the worker concerned. Nine minutes is approximately 15% of an hour and it is interesting to note that in every form of human activity, 80 to 85% of productivity is the maximum ever obtained over long periods. It does not matter what the particular activity may be, whether it is singing in an opera, playing in an orchestra, driving an express train or running a lathe or a type-

## TIME AND MOTION STUDY

writer, the productive efficiency, over a period of days, weeks, or months, will be found to be not greater than 80 to 85%.

MR. CARGILL: Is there any time allowance for broken twist drills on such a job?

MR. CLAYTON: If you are thinking of the youth who was employed drilling the forgings you will recall that he was not required to grind his own drills. Had he been expected to do so, the time so spent would have had to be included in the time study. I might here mention, in connection with time study, that it is very easy to make too many allowances, with the result that there is very little time left upon which to fix the piece work rate. For the average shop, as I said in the paper, it will be found that a 15% overall allowance, coupled with a high incentive (say 50% of the time or hourly rate in return for a productive efficiency of 85%) will produce the best results. In this case an industrious man will go all out to get the 50% and the less able will, at the same time, be enabled to earn a satisfactory pay for rather less work.

MR. BURNS: I do not think that in the ordinary industrial organisation, as we know it in Edinburgh, motion study would pay itself. And another thing—the reaction of the Edinburgh worker to photographic arrangements and bulbs tied on to his fingers, well, I don't know, but I don't think it would function in our district.

Mr. Clayton has evidently seen from the press something about trouble in Edinburgh and ventured to suggest that this trouble could be avoided. However, I might mention to Mr. Clayton that without knowing the circumstances, that is a statement I am not prepared to accept. The handling of that operation was in the hands of a capable man. I know him very well, and if Mr. Clayton knew the conditions under which the time study of the organisation was taking place, I am quite sure he would have had a different view.

The question of demonstrators has been mentioned and I agree with what has been said. A demonstrator in a works making a varied class of goods is compromising the time study man. It is not reasonable to suppose that a demonstrator can go forward to any job and compete with a man who has been working for many years in a competitive job.

The question of the 15% allowance. I have taken a note of that and agree that 15% all round is a proper allowance. The fatigue allowance is a very important factor, there is no doubt. It becomes a debatable point, the question of fatigue, and requires a good deal of common sense and experience, so that 15% can be accepted as a fair figure. In some cases, I might even say that the fatigue allowance might amount to 40%; that may sound exaggerating, but I dare say that could be proved.

Then the 39 in. of string suspended from a pendulum. Well, I

don't think in a question of time study we would resort to practices such as hanging a piece of string in an obscure corner of the shop and taking a quiet look at it. That is a recognised method, I have heard of it before, but, personally, I would never agree to anyone in my charge adopting methods such as that.

There is a point I should like to mention. An instance I had several years ago, oh, during the war, in a certain motor factory, a particular job was allowed four minutes to drill, and the operation consisted of taking this little piece, putting it into a small jig, swinging over a clamp, turning a shaft nut, putting it forward to the drill and drilling, opening the shaft nut, throwing back your clamp and taking out your article, brushing out the jig and proceeding. During the war we had some very bright refugees coming over to this country. One little Belgian came into this particular works and found that this part had a small dimple in the centre and he put the jig aside and he drilled the job. He was allowed sixty-six hours to do 1,000 at four minutes each, and he did the whole lot in eight hours. Now, what would Mr. Clayton suggest in a case of that kind. Does he believe in cutting rates? Does he believe in encouraging a man to use his common sense? What method would he take?

Another point I should like to mention, as to the qualification of a time study analyst. That has not been mentioned. I think Mr. Clayton was rather inclined to view that a man could be taken out of some part of the shop and given a watch and put into the shop and time study. Well, that may be all right in engineering shops where speed is the main factor, but I think that the qualification of the analyst is really a very important matter. It is very difficult to tell when an operator is working at 100% or 70%. Your question of experience and training of a time study man is, I reckon, possibly outside the engineering industry, where, I admit, time study is a very much simpler thing than it is in some of our more difficult hand-operated products. In the engineering shop, when all is said and done, clubs can be set up, but it is a vastly different thing to go forward to two girls who are doing about 1,000 things. The question of the analyst becomes of paramount importance if a man knows his job and knows whether he is being hoodwinked or not.

MR. CLAYTON: In answer to Mr. Burns' interesting observations, first, with reference to the time study man himself. I am sorry I have managed to convey to Mr. Burns the impression that, in my opinion, any one can be a time study man. This is one of the points upon which I have perhaps been at a slight disadvantage to-night. You will recall that Mr. Bennet mentioned that this evening's paper is really a continuation of an earlier one on the same subject and, in that earlier paper the selection of a time study man was dealt with at greater length. It will suffice to say here that you cannot

take any man, or shall we say the first man you encounter in the shops and expect to discover a good time study man. I might add that in my opinion there are a good many men masquerading as time study men under the title of rate fixer who know very little about the subject. That, however, is the fault of the management who creates such roles and hires such men.

As regards the 39 in. of string, well, the purpose of a paper such as this is to provide information and this item, surely interesting, is given under that heading. With reference to the Belgian who ran away with the job, the abandonment of the jig seems to me to alter the method of manufacture and justify a re-setting of the time allowance. Referring to the 15% time allowance. Mr. Burns will recall that I cited it as being suitable in the generality of cases. There are also cases in which such an allowance is not adequate but the experienced man recognises these and deals with them accordingly.

MR. LEE : With reference to this matter of allowances, I think, possibly, that some little weight would need to be placed on just where the studies are taken. I have had a little experience of that and I have come across study men who are, if I may use the word, definitely sloppy. If you add on 15% to their figures, then, of course, you get an increased sloppiness. But where the time study people are really efficient and know their job thoroughly this question of allowance is of increasing importance, I think. As a matter of fact, in a case of a man doing brain and mental work, it was found, as a result of a test, that the addition of figures actually called for an allowance, due to fatigue, of no less than 25%, apart from any other lost time which took place. If you sit down for an hour and do a good bit of hard mental work, if you try to do your work too hard you do not actually do forty-five minutes, or the result is that you do your forty-five minutes of hard mental and take your fifteen minutes rest. But this matter of allowances is really quite important. I have seen manual workers with allowances of 25% due to foul conditions. In one such case the condition of the atmosphere and the whole place was really filthy, and the man concerned was ordered to go out into the fresh air for ten minutes every hour. It was very hard work and fatiguing.

MR. CLAYTON : Without exception, I agree with everything Mr. Lee has said. Reverting again to the question of time allowances. It is probably true that a mathematician such as an actuary or someone of that kind would represent a case where a 15% allowance would be insufficient. It is probably that work that involves intense mental effort or concentration might require allowances up to 50 or 60%. That is, productive time would be no more than from 40 to 50% of the gross time involved. My paper to-night has been

directed at the average shop with average conditions and with particular reference to engineering. Where working conditions are very bad as in the other case cited by Mr. Lee, an attempt should obviously be made to improve them.

MR. LEE : With reference to the question of soldering and the actual method of rating. The Bedaux engineers claim that they can make time studies such that the variation in result is not more than 2%, although one operator may be ever so much faster than another.

MR. CLAYTON : Without doubt the Bedaux engineers have developed their system to a wonderful degree. Mr. Chas. W. Lytle, an American authority on payment by result systems, says that, from the point of view of labour, the disadvantage of the Bedaux system is that it offers a smaller incentive than any other system.

MR. CAMPBELL : I was very interested in Mr. Clayton's investigations into office work. I think, however, he missed that point of Mr. Lundy's regarding typists. Do they have an expert there to demonstrate to the girls—do they actually demonstrate to a girl at a time?

MR. CLAYTON : With reference to the office reorganisation mentioned in the paper and referred to by Mr. Campbell. The typists were not interfered with in any way and no incentive was used. No demonstrators were used to train the typists. I found, in that particular case, that practically the whole of the trouble lay on the poor quality of the dictation and the lack of organisation in relation thereto; the fault did not lie with the typists at all. At 35 words per minute they achieved a machine efficiency of 85% which was quite satisfactory. We did attach stroke counters to the machines but not for the purpose of speeding up the girls. By means of the stroke counters we were able to know how many strokes were made in a day by one machine. When the number of strokes made during overtime equalled those made by one machine in one day we hired an extra girl and stopped the overtime. Further as business expanded or contracted we hired or released typists accordingly, just as is done in the shops in the case of tradesmen and other labour, thus our typing work was carried out on a direct labour basis and ceased to be a part of overhead. One interesting discovery I made during this investigation was that in typing with the margin stops set at 10 and 75 the number of words per line always averaged 10 and the number of letters per word always averaged five. No matter how many pages are typed and no matter what the subject typed may be, if it is in the English language it always works out at 10 words per line of five letters per word.

